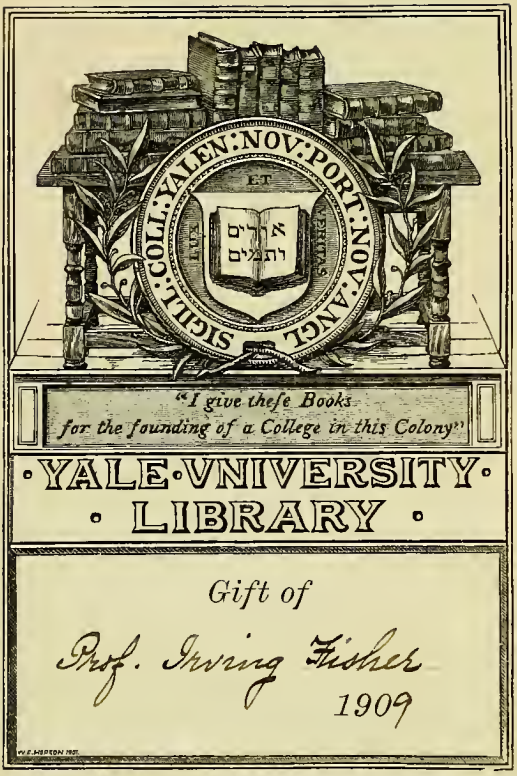
THE BABY



THE BABY

A BOOK FOR MOTHERS AND NURSES

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PREFACE

MANY of the disorders and some of the diseases of infancy are directly due to improper management; indeed, apart from inherited disease, or vices of constitution, and the natural feebleness of the body, the health, and in many cases the life of the infant depend upon the care it has. Generally the responsibility rests upon the mother, or the nurse, for whose guidance this little book is presented.

Encroachment upon the peculiar province of the physician has been studiously avoided. Whether generally true or not, it is certainly true of medicine that a little knowledge is a dangerous thing; except, therefore, for reference to some of the common slight ailments, and to simple measures of treatment that are useful in "emergencies," diseases in infancy are considered only in their relations to preventable causes.

In view of the diminished and diminishing birth-rate in American families, and of the increasing inability of the American mother to nurse her baby, the subject of artificial feeding is becoming more and more important—of vital interest and concern not only to the individual and the family, but to the community.

But until its difficulties and its risks are generally recognized, both the prescription of the food and the direction of the feeding are likely to be left, as they are now, to the mother and the nurse. And infants cannot be fed successfully by rule; knowledge of the principles of what may be termed rational feeding is absolutely essential. Many infants live, of course, in spite of improper and imperfect food; and many die, or are badly developed, or sickly, because they are not fed right. Accordingly the subject of Food and Feeding has received very full consideration.

While the author has written largely out of his own experience, professional and parental, the instruction is believed to be in consonance with the teachings of generally accepted authorities, save that in the discussion of the principles of substitute-feeding the results of comparatively recent investigation, already abundantly confirmed by experience, have been taken into the account.

The portion of Chapter VI that deals with the preparation of modified milk is adapted from a paper read by the author before the Section of Diseases of Children of the American Medical Association.

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CHAPTER I

The Period of Infancy

THE period of infancy, which extends from birth to the completion of the first dentition, occupies about two and a half years. It is a period of extraordinary activity in development and growth; within it the most complex of living creatures, the conditions of whose existence have been suddenly and completely changed by birth, is fitted to a new environment; and this necessarily involves profound changes both of structure and of function in its organism.

Some of these changes take place at once; others are deferred, or occupy considerable lengths of time; indeed, the body does not reach its full development before the age of about twenty-five years. Among the immediate changes, for example, is the establishment of respiration and of independent circulation of the blood. Before birth the child is nourished by the blood conveyed to it through vessels in the cord that unites it to the mother; at birth this cord is severed, of course, its arteries and veins shrivel to become fibrous bands, and wholly independent circulation of the blood is at once

established. At birth, the stomach is merely a dilatation of the lower end of the gullet (œsophagus). Other abdominal organs, also, are hardly more than rudimentary; the liver, however, is very large, occupying nearly one-half the abdominal cavity. The framework of the body (skeleton) is largely composed of cartilage (gristle), which is very gradually converted into bone by the deposition of lime salts.

To meet certain extraordinary demands of the system, both the heart-beats (pulse) and the respirations are very rapid—the ~~former~~ latter numbering from 35 to 40, the ~~latter~~ former from 125 to 140 a minute; and what is true of the digestive and osseous systems is true of the greater part of the body. Infancy is preëminently the period of physical change—of development and growth.

Manifestly, therefore, there are considerable differences between the physiology of the infant and the physiology of the adult, and right management in infancy requires that these differences shall be understood and taken into the account. That they are not understood, and not taken into the account, appear in the shameful records of infant disease and infant mortality that are written year after year. While some of the causes of these deaths must be regarded as unavoidable—such, for example, as malforma-

tions, the naturally feeble powers of resistance, the diseases peculiar to infants, or to which they are especially liable—a very large, probably the greater number proceeds from ignorance or carelessness of management, particularly as to the food and the feeding.

It is estimated that in this country, during a census period, infants equal in number to one-fifteenth of the whole population at the end of the period are born to die within two years, and that fully one-half these deaths are from preventable causes.[1] It appears that our race-suicide is committed after children are born to us, also.

Mortality is highest in earliest infancy, and progressively decreases with advance in age; the older the infant, or child, the greater the probability that it will reach maturity.

Practically, that is, so far as the care of the infant is concerned, the most important deficiencies in development are found in the digestive system, by reason of which starch, which forms so large a part of the diet of the adult, and fat, except milk-fat, can be digested but incompletely and imperfectly, if at all, during the earlier periods of infancy.

[1] Committee of One Hundred, of the American Association for the Advancement of Science, on National Health.

CHAPTER II

The New-Born Baby

IN the nature of things, the new-born baby must be committed to the care of an attendant, preferably a trained nurse, who should be competent to take and who should have full charge of affairs in the lying-in chamber, under the direction of the physician in attendance.

Other things equal, the nurse, in all cases, is most efficient who is most faithful to her instructions. A disposition to disregard the directions of the physician, or to question them, is a pretty sure indication of incompetence. Although the mother can have but little share in the care of the new-born baby, it is desirable that she should know something about it, that, on the one hand, the child may not suffer from neglect or ignorance on the part of the nurse, and, on the other, that the capable nurse shall not be interfered with should her methods fail to meet the approval of interested relatives and friends.

The infant should be received from the hands of the doctor in a well-warmed woolen blanket, in which it should be wrapped snugly. As soon as may be, the eyes—which must be

well shielded from light—and adjacent parts should be carefully and thoroughly cleansed and the lids bathed in warm water (at a temperature of 100°). This immediate local cleansing is designed to remove and prevent the entrance of certain foreign material that may be present, and which is capable of setting up very serious inflammatory disease of the eyes. But a bath should not be given at this time, not only because prolonged manipulation is exhausting to the child, but because the unctuous material that covers the body is not soluble in water; there is risk from the exposure, also. Instead, the body should be anointed with olive oil, or with some bland ointment—vaseline serves the purpose very well, and even lard will do; an ointment softens the unctuous material referred to, which may then be wiped off easily. Soft rags of old linen, to be afterwards burned, should be provided for this purpose. The manipulation should be gentle, but as rapid as possible.

The following mixture makes an excellent ointment for the baby's toilet at all periods:

℞

Boric acid	7 grains
Solid albolene	2 drachms
Liquid albolene	2 drachms
Lanolin (anhydrated)	4 drachms
Rose water	5 drachms

The cleansing, which should include the nostrils and nose-passages, having been completed, the remnant of the cord demands attention. A "dry dressing" is the only proper one. A small central hole should be cut in a square of perfectly clean old linen, and the stump of the cord drawn through it. A little baby powder may be dusted over the skin between it and the linen, which is to be wrapped around the cord. Ointment is not necessary.

In the absence of discharge, or sign of irritation, this simple dressing should not be disturbed until the cord drops off, as it will in from five to ten days, leaving a perfectly healed surface at the navel.

Before the infant is dressed, the skin should be anointed wherever its surfaces come in contact, or it is exposed to irritation from the discharges.

As soon as the cord has been attended to, the abdominal band—made from flannel, "all wool," and wide enough to cover the entire abdomen—should be put on; next comes the shirt; then the "pinning-blanket"; finally the diaper. The initial toilet is now complete and the infant is tired. Accordingly it should be loosely wrapped in a light blanket, put in a warm place (if practicable, by the side of the

mother—bearing in mind her own need for rest), and left to go to sleep.

Except the abdominal band, which should give slight support, without, however, exerting the least compression, all the clothing should be very loose. Especial care must be taken that the pinning-blanket is not drawn too tight.

The infant should be accustomed to light and to sound gradually. For the first two or three days its only needs, usually, apart from quiet, are warmth and sleep, though it may be put to the breast, if strong enough, after the mother is sufficiently rested; not that food is needed so soon, or can be obtained from this source, for the breast-milk does not appear ordinarily before the third day; but because early slight irritation of the nipples is helpful to the mother from its effect upon the womb. The first secretion of the breasts after childbirth is a yellowish, viscid fluid, quite different from milk, called "colostrum." It has very little food value, but is useful to the baby because of its laxative property.

The first discharges from the bowels are dark green in color and of a tarry consistency; but after two or three days they should take on the bright yellow color that is characteristic of the dejections of the healthy infant.

Generally the bowels move and the bladder is evacuated within three or four hours after birth; but in the absence of malformations, that are easily discoverable, a delay of even two or three days in the appearance of these discharges need cause no alarm.

Until true lactation is established, the child should not have the breasts oftener than three times in each twenty-four hours. Constant attempts at suckling meanwhile can only do harm; the fact that nature does not provide food immediately is pretty good evidence that it is not needed, and, unless lactation is delayed beyond the third day, there need be no fear that the infant will suffer in any respect if food is withheld until the appearance of the breast-milk. But after the second day, or after thirty-six hours, if the child is fretful, or does not sleep, a few teaspoonfuls of a solution of milk-sugar in warm water (a level teaspoonful of milk-sugar to four or five tablespoonfuls of water), or of fresh cows' milk diluted three or four times with warm water and sweetened, may be given at intervals of six or eight hours until the breasts fill, or the bottle feeding is begun. The doses of catnip tea, sweet oil, molasses, and what not that the unhappy infant is sometimes induced to swallow are positively injurious. If food is

given at this time, an artificial nipple of rags dipped in the diluted milk should be given the child to suck, as it is much more likely to refuse the breast if fed from a spoon in advance.

Before the baby is put to the breast, the nipple should be elongated by manipulation, or by suction. Care should be taken that the position of the nursling is convenient and comfortable—the head and shoulders raised—and that the distended gland does not interfere with the free passage of air in and out of the nostrils. After nursing, the infant should be laid on its right side, so that the heavy liver will not press upon the stomach, and left undisturbed.

The new-born baby has but little vitality, and its powers of resistance to injurious influences generally are feeble. It is extremely sensitive to cold: a sudden chilling of the surface of the body, or exposure for any length of time to a temperature much below blood heat (98½°), may be the cause of serious illness, and serious illness at this period is almost always fatal. Pending the appearance of the breast-milk, the less the child is handled, or disturbed for any reason, the better; soiled diapers must be changed, of course, and local cleanliness is necessary to prevent discomfort and chafing; but it need not be taken up for these purposes. A

full sponge bath should not be given until after the separation of the remnant of the cord.

The earliest wardrobe should include at least three of the following articles: pinning-blanket, shirt, abdominal band, petticoat. There should be a liberal supply of diapers; they may be made from old cotton cloth, which is much better for the purpose than new. The special "diaper cloth" to be had at all the shops is still better. Diapers should be a yard and a half wide, and folded once. Very thick diapers are not only uncomfortable, and when wet burdensome on account of their weight and likely to chafe, but they may cause deformity of the legs—the bones of the infant being very easily bent. Rubber diapers, which prevent evaporation, should not be used at any time, continuously.

Shirts should be high in the neck and have long sleeves.

Bands should be about four inches wide and long enough to go once and a half around the body. The underwear should be "all wool," both in winter and in summer; if this material irritates the skin, it may be lined with linen. Silk is the best substitute for wool.

At birth there are considerable spaces between certain contiguous bones of the cranium, so that the skull is quite readily compressible.

Accordingly the head of the new-born baby is often misshapen from the pressure to which it is subjected in the birth. But these deformities always disappear naturally, and they should be left wholly to nature.

In the middle line of the cranium—from before backward—there is a large opening which marks the junction of the bone of the forehead with the two bones—one on each side—that form the side walls of the skull; this opening is called the "anterior fontanelle." A corresponding opening in the same line, at the junction of the side bones with the bone that forms the rear wall, is called the "posterior fontanelle."

The latter closes within five or six weeks, but the anterior fontanelle remains partly open until the child is from nine to twelve months old; from this time it becomes gradually smaller until the nineteenth or twentieth month, when it should close completely. An open fontanelle after the twentieth month is an early sign of Rickets.

Especial attention is directed to the fact that the space in the upper part of the throat into which the nasal passages open behind, and through which the air must pass from the nose to the windpipe and the lungs, is very small.

"Adenoids" in this situation, or even swelling of the parts from so slight a cause as a "cold in the head," may be a very serious matter in early infancy.

CHAPTER III

The Elements of Food — Digestion

THE food and the feeding of the infant are the most important subjects that we have to consider; improper or imperfect food not only increases the natural liability to disorders and disease, in early infancy particularly, but is the direct cause of certain diseases from which the well-fed infant is exempt. By far the greater number of these cases—of ill-development, malnutrition, and disease—is found among infants who are deprived of their natural food, the mother's milk; but as the majority of "bottle babies" live, and some of them thrive—apparently, at any rate—in spite of unsuitable food, the difficulties and dangers of substitute-feeding are not generally appreciated, and, in practice, the physician is not called upon to direct it so long as the infant keeps fairly well.

Artificial feeding, however, is always unnatural and hazardous; while it may be employed successfully in a large proportion of cases, the management of the dyspeptic infant often taxes the resources of the most accomplished and experienced physicians, and no absolute rules can

be laid down even for the feeding of the normal infant in health. But there can be no doubt that the number of "difficult cases," the disorders, and the diseases of early infancy would be materially lessened if the mother and the nurse, upon whom the responsibility usually rests, both to prepare and to prescribe the food, were instructed in the principles of what may be termed rational feeding.

Normal breast-milk is the only perfect infant food; and the healthy mother who nurses her baby, provided the milk is normal, both conserves her own health and largely increases the probability of life and health for the child.

But the nursling, also, may be imperfectly nourished; and the evils of malnutrition are so great that no least risk that can be avoided should be taken. Even to appreciate the risks, one must know something about the elements of food, something about digestion, and in what respects the digestive organs and powers of the infant are comparatively deficient. The right conduct of substitute-feeding, without this knowledge, is simply out of the question.

THE ELEMENTS OF FOOD

Perfect nutrition of the body requires that the food shall contain all the food elements, of

which there are four classes: proteins, fat, carbohydrates, minerals.

1. The principal proteins are:

Albumin—of which the white of egg is an example.

Casein—the cheese principle of milk.

Myoscin—the essential principle of muscle (lean meat).

Gluten—the chief vegetable protein, found in wheat particularly, and in most cereals used as food.

2. Fat.

Fat may be obtained from many sources, but is supplied mainly by the fat of meat, in butter (milk), and in vegetable oils.

3. Carbohydrates.

Practically all the carbohydrates are furnished by two substances, starch and sugar. Starch and most of the sugar employed as a food are vegetable products; starch is found in potatoes and in most grains—corn, wheat, etc.; sugar also is very widely distributed in vegetables and fruits.

4. Minerals.

Water is usually included among minerals, which are derived from inorganic matter. They comprise, also, numerous chemical compounds known as "salts," of which the chloride of so-

dium (common salt) is an example. Uniting with other substances, they form a large number of new chemical compounds in the body; but their chemistry is so complex that we know very little about them, except that they are essential to nutrition.

The three elements—fat, proteins, carbohydrates—all have their source in the activities of living beings, animals, or plants; they may be regarded, accordingly, as the vital elements of food. Each has its particular use in the nutrition of the body, though it may serve other purposes also; thus, fat has the especial office to keep the body warm, but it also gives it energy —power to do its work. Carbohydrates—starch and sugar—are sources of energy; but they yield heat, too. Both fat and carbohydrates changed to fat are stored up in the body to meet future demands. Proteins, and proteins only, are the tissue-building elements; they provide material for the growth and repair of all the tissues, as bone, muscle, nerve, etc.

While fat may do duty for carbohydrate and carbohydrate for fat, and proteins for both, neither fat nor carbohydrate can take the place of proteins as builders of tissue.

A rational dietary supplies all these food elements in suitable proportions, though the pro-

portions that are suitable for the individual depend upon the circumstances or the conditions in each case; upon climate, for example, and the work that is done. Accordingly, the Eskimo consumes enormous quantities of fat in order to meet the extraordinary demands of the body for heat, and the working man—the brain worker as well as the muscle worker—requires a larger relative quantity of proteins to make good the loss of material that labor of any kind involves. It is, of course, practically impossible to provide a diet for the adult that is perfectly adjusted to the needs of the individual in each case; and this is not necessary. Almost everybody takes more food than the system requires—there is an oversupply of all the food elements. But in the case of the adult, nature is usually able to dispose of the redundancy, and with an ill-balanced diet to deal with, to supply the deficiency of one element from the excess of another, making proteins do duty for carbohydrates, for example, and carbohydrates fill the office of fat.

But in infancy development is incomplete—the digestive organs are comparatively deficient and their powers comparatively feeble; accordingly, too large a quantity of food, too much or too little fat, an excess or a deficiency of proteins and sugar, may give rise to disorder and disease.

The infant's food, therefore, must be adjusted much more carefully to the actual requirements of nutrition.

DIGESTION

In order that the food elements may be appropriated by the body as nourishment, certain chemical changes must be made in them. These changes are effected by the action of special fluids—secretions—with which the food substances come in contact in their passage through the mouth, stomach, and small intestines. These fluids are known as the digestive juices. Together they accomplish the digestion of all food substances; that is, they separate the nutritious elements therein and fit them for absorption.

In the process of digestion the proteins are converted into peptones; the fat is emulsified—minutely divided into separate particles, as it is found in milk, which is a perfect emulsion; the starch is changed into sugar (glucose). All this is accomplished mainly by the action of four fluids—the saliva, the gastric juice, the pancreatic juice, and the bile.

The saliva is a mixture of the secretions of three large glands—in pairs—and numerous small ones that discharge into the mouth. Its action is largely mechanical, but it has the power

of changing starch into sugar. It is faintly alkaline in reaction.

The gastric juice is the acid secretion of a large number of glands situated in the walls of the stomach. Its especial and sole office is the digestion of the proteins in the food; fat and carbohydrates are not affected by it, and therefore pass through the stomach unchanged.

The pancreatic juice from the pancreas and the bile from the liver flow through a common duct that empties into the upper part of the small intestine; together they have the power to emulsify fat, to change starch into sugar (glucose), and, to some extent, to digest proteins. The main points to be remembered are: (1) that the gastric juice is acid and digests proteins, and proteins only; (2) that the pancreatic juice and the bile together digest fat and carbohydrates, and proteins that escape digestion in the stomach.

Solid foods should be masticated thoroughly before they are swallowed, in order that the protein substances may be finely divided and the carbohydrates well mixed with saliva before the mass reaches the stomach. In the stomach the food is exposed to the action of the acid gastric juice, which dissolves the proteins contained in it and fits them for absorption. Stomach digestion occupies from one to four hours, depending

upon the digestibility of the food. The digestion of the proteins having been completed, or nearly completed, the contents of the stomach pass slowly out into the small intestines.

In the upper portion of the small intestines the food is subjected to the action of the pancreatic juice and the bile, which together digest the fat and the carbohydrates, also, the proteins that have escaped from the stomach undigested. By the combined action of these different secretions, the nutritive elements are converted into a milk-like fluid called chyle, which is taken up from the intestines by the absorbents—minute blood vessels (capillaries) and other little vessels similar in structure, called lacteals, that are situated in the intestinal walls. The chyle that is absorbed by the blood vessels is conveyed from them directly to the liver, through which it passes to undergo certain changes before it is added to the circulating blood. That which enters the lacteals (this portion of the chyle contains almost all the fat) is carried by lymphatic vessels (which are like the veins in structure and in function, except that, in other situations, they convey lymph instead of blood) to a small pipe, or tube (the thoracic duct), which ascends from the abdomen through the chest (thorax), and discharges directly into the blood current through a vein at the root of the neck. After

the separation and absorption of the chyle, the innutritious residue of the food substances passes on into the large intestines, from which it is finally expelled as waste material.

In the stomach the food is kept constantly in motion by the action of the muscles of which the walls of the stomach are mainly composed, which gives it a sort of churning movement; by this means the whole mass is thoroughly mixed with the gastric juice. Intestinal digestion is assisted in the same way by the peristaltic movements of the intestines.

In infancy, the gastric juice is comparatively weak; and until the child is three or four months old, the salivary glands and the pancreas are rudimentary (the pancreas is not fully developed until near the end of the first year). Neither starch nor fat, therefore—except the fat in cream and milk—can be digested in early infancy. During the first year, indeed, only the more soluble proteins—as the albumins of milk—are perfectly digested; the vegetable proteins, myoscin, and solid foods generally are practically indigestible at this period.

These deficiencies of the digestive organs, and the comparative feebleness of their powers, at once suggest the difficulty of providing suitable food for the infant who is deprived of its natural aliment—the mother's milk.

CHAPTER IV

Lactation

IN normal breast-milk the food elements are especially adapted to the peculiar needs of the infant, both in quantity and in character. But breast-milk is not always normal; chemical analyses show wide differences in its composition; its food elements may differ in character, also. Apart from variations dependent upon the general physical condition of the mother, the composition and character of the breast-milk are profoundly affected by disorders of the nervous system from mental excitement, or emotional disturbances; the conditions of modern life for a large number of women are distinctly unfavorable to the secretion of normal milk on this account.

The popular idea that the quantity of the breast-milk may be increased directly by certain drugs, or by the use of beer, ale, porter, and the like, is not warranted. These agents may be useful in some cases to stimulate the appetite, or to assist the digestion, but they have no specific action. In individual instances, the milk is affected by particular articles of food eaten by

the mother, by certain vegetables, and by certain kinds of fish, especially, which in these cases should be avoided.

The nursing mother should have a simple but nutritious and varied diet and regular meals. During the period of night nursing, particularly, a glass of milk, chocolate in some form, or other food may be taken with benefit between the meals, and if sleep is much interfered with, during the night also. Water should be drunk freely.

Especial care should be taken to obtain sufficient sleep, particularly sleep by night, and to this end night nursing should be limited to the actual necessities of the infant. An even temperament is quite as important as even health.

Assuming that the mother is able and willing to nurse her baby, that the milk is sufficient in quantity and normal in character, successful lactation requires, therefore:

1. A well-balanced diet, with regular meals.
2. Regular habits as to exercise and sleep.
3. Freedom from mental excitement and emotional disturbances.

Unless these requirements are met, the milk is likely to be unsuitable, and may be utterly unfit for the child.

When, therefore, the nursling does not thrive, suffers from indigestion, or is fretful and out of sorts, a chemical analysis of the milk will usually reveal the cause of the trouble. In these cases the breast-milk may be "modified" by making suitable changes in matters of diet, exercise, habits, etc.; thus, the quantity of fat in breast-milk is diminished by disturbances of the nervous system, by lack of sufficient sleep, by an excess of fat, or a deficiency of proteins in the food.

Proteins are decreased by exercise. Sedentary habits and a generous diet increase all the food elements.

The instruction in Chapter VI as to the number of feedings, the intervals between them, night feeding, etc., applies equally to the management of the nursling.

Among hindrances to successful lactation are depressed nipples, "sore" nipples, and inflammation of the breasts. The nipples may be developed—elongated—to some extent by manipulation—pulling them out from the breast—which in some cases may be begun a month or two before the birth of the child; but only the gentlest handling is permissible, on account of the risk of setting up contraction of the muscles of the womb, and so causing a miscarriage, and the

risk of injury to the nipple itself. The nipples may be "toughened" somewhat by bathing them with an astringent lotion, such as a weak solution of alum in alcohol and water—about five grains of alum to an ounce of mixed alcohol and water. The use of this lotion should be followed by the application of a mild ointment—one part of lanolin to three parts of cold cream. An astringent alone increases the liability to fissure (cracked nipples).

Very great tenderness of the nipples in the beginning is a frequent event. Generally, this disappears within a few days, if care is taken to keep the parts perfectly clean. Indeed, perfect cleanliness is essential at all periods, not only as the most effective preventive of local troubles, but because the lack of it directly exposes the nursling to disorders of digestion and to disease. After each nursing, therefore, the nipple should be washed with cool water as a routine practice. If the tenderness persists, careful examination usually discloses a small crack, or fissure, or an area of "raw" surface, which requires treatment. Probably the most generally useful remedy for these conditions is the *compound tincture of benzoin,* which should be applied with a small camel-hair brush after the surface has been thoroughly dried with a bit of clean

linen rag. Several thin "coats" of the benzoin should be painted over the fissure, or excoriation, as often as need be to keep it well covered. Until the parts are thoroughly healed, a nipple shield must be employed, which most infants may be taught to use, with a little persistence. The "Acme" shield is one of the best. Shields with rubber tubing attached should not be used unless the tubing is renewed daily. If the child is unable to make use of the shield, the milk may be drawn with a breast pump and fed from a bottle. One or the other of these expedients may be necessary, also, in cases of depressed nipples.

The appearance of hard swellings, or lumps, in the breast indicates a disorder of the gland, which may cause simply an arrest of its activity, or give rise to inflammation and ultimately to suppuration (abscess). These swellings may be painless at first, but are usually sensitive to pressure. In this condition, prompt treatment will often prevent serious trouble; the breast should be carefully and thoroughly massaged—the movements being made from the circumference of the gland towards the center (nipple) always. If there is great tenderness, the breast should be stroked rather than rubbed, always in the one direction, towards the nipple, no force being used at first; but generally, as the stroking is

continued, the tenderness becomes gradually less, until at the end of ten minutes, pretty deep pressure may be made without causing pain. The object of this massage is local stimulation, and the freeing of the milk ducts, in which the milk may become so thickened that they cannot be emptied by the usual means. If carefully and skillfully employed, this treatment may be applied to very "sore" breasts, with the happiest results in many cases. It should be continued at intervals until the lumps and tenderness disappear, the milk pump being used, also, several times a day, if need be. Meanwhile, the affected breast may be supported by a bandage, or swathe. If, in spite of this treatment, the gland becomes hot and painful—inflamed—the physician must be consulted without delay.

CHAPTER V

Substitute Food

INFANTS,[1] even the normal infant in health, cannot be fed successfully by "rules." Requirements differ with individuals and with individual conditions.

Without some knowledge of the principles involved and of the facts upon which they are based, substitute-feeding cannot be directed properly, however clear and full the instructions for preparing the food may be, or however carefully they are carried out. To assume the responsibility without this essential knowledge is to expose the child to grave risks—some of them immediate, some remote but not less serious, or less certain, because the effects of the mismanagement may not appear until long afterwards.

Since normal breast-milk is a perfect food, and the only perfect food for the infant, it follows that the food most like it, or that can be made most like it, in composition and in the character of its food elements, is the best substitute for it; and this is found, as would naturally

[1] In the discussion of substitute-feeding, the term "infancy" refers to the period between birth and the end of the first twelve months.

be expected, in the milk of animals. The milk of different animals has been used, but none has any particular advantage over cows' milk, which is cheap and everywhere available. Especial study has been given to cows' milk, accordingly, in the endeavor to determine precisely the differences between the two fluids, and how to overcome them.

The most important differences disclosed by chemical analysis are shown in the following table:

TABLE I

CHEMICAL ANALYSIS

Breast-milk.	Per cent.	Cows' milk.	Per cent.
Proteins { casein	0.50	Proteins { casein	2.90
Proteins { whey-proteins	1.00	Proteins { whey-proteins	0.60
Total proteins	1.50	Total proteins	3.50
Fat	4.00	Fat	4.00
Sugar	7.00	Sugar	4.50
Salts	0.10	Salts	0.70
Water	87–88	Water	86–87

It appears from these analyses that both cows' milk and breast-milk contain all the elements of food; to this extent both are perfect foods. In both, these elements are the same in kind, also;

but, except that the amounts (percentages) of fat are equal, their quantities and proportions are quite different. If these were the only differences, however, it would be a very simple matter to make cows' milk equivalent to breast-milk as a food for the infant; but, unfortunately, the food elements differ in character, also.

The proteins in both foods consist of casein and whey-proteins; but cows' milk contains almost six times as much casein as breast-milk, and but little more than half as much whey-proteins.

Casein is the cheese principle of milk, the substance that forms the curd, or curds, when rennet is added, as in the making of cheese. It is curdled by acids, also. The clear liquid that remains, after the casein has been curdled and removed, is whey. Whey contains the whey-proteins, which are mainly albumins; like white of egg, which is pure albumin, they are curdled by heat but not by acids.

The fat of cows' milk differs very much from that of breast-milk, both in composition and in character, particularly in that it contains a very large quantity, comparatively, of fatty acids. These acids are irritating, and, in the case of the young infant especially, whose fat-digesting power is feeble, likely to cause digestive dis-

turbances. Moreover, the fat of cows' milk is of itself less digestible than that of breast-milk.

For a long time it was supposed, and medical text-books, unless very recently published, teach, that the casein of cows' milk is especially difficult of digestion for younger infants. In the endeavor to change the character of the casein—make it more digestible—different means have been employed: various chemical agents have been added to the milk, the proteins (casein) have been predigested, the casein has been removed altogether, and whey instead of milk used in preparing the food. But comparatively recent investigations have shown that the digestive disturbances so long attributed to casein are much oftener due to the relatively indigestible fat, which, as we have seen, differs very much in composition and in character from the fat of breast-milk. The lumps of "cheesy" material in the stools of infants suffering from indigestion, commonly taken for "curds" of casein that have passed through the alimentary canal undigested, are found to be masses of fat, or clumps of bacteria.

While these discoveries have undoubtedly simplified the problems of artificial feeding, cows' milk is by no means equivalent to breast-milk as food for the infant, nor is it suitable

for this use without considerable modification. That it may meet the most obvious requirements as a substitute food, it is necessary to reduce the quantity of proteins and to supply the deficiency of sugar. These modifications may be effected by dilution and the subsequent addition of fat to restore the fat-percentage, and of sugar to restore and increase the sugar-percentage. For these several purposes, plain water, or cereal waters, cream and milk-sugar, respectively, are the most suitable materials. In certain conditions whey may be substituted wholly, or in part, for milk, with advantage. Of the different chemical agents that have been added to cows' milk with view to making it more like breast-milk, or more digestible, lime water is the most generally efficient; and a small quantity of lime in the food is in itself of service.

These materials, of which all but the diluents and lime water are derivatives of milk, meet the indications best, and are to be employed generally in the preparation of substitute food. Each serves, or is intended to serve, a particular purpose, and to this end certain conditions should be fulfilled; moreover, there are different varieties of the milk products (cream, etc.). In the first place, therefore, it is necessary to consider the materials themselves, and they are grouped accordingly:

Cream.
Milk.
Whey.
Milk-sugar.
Lime water.
Diluents—plain water, cereal waters (barley water, oatmeal water, rice water).

CREAM

Cream contains precisely the same elements that are found in milk. It may be regarded, indeed, as a very rich, superfatted milk, though the elements are in somewhat different proportions.

The fat in cream—and milk—is in the form of an emulsion; that is, very minute globules, each in an extremely thin envelope of albumin, and all "suspended" in the fluid. As we have seen, all fat taken as food must be emulsified before it can be absorbed; if, therefore, the emulsion is broken down and the fat globules set free, cream is less digestible. The emulsion in cream is destroyed by violent shaking, as when cream is churned to make butter; freezing, also, breaks it down to some extent.

There are two kinds of cream:

1. Gravity cream.
2. Centrifugal cream.

Gravity cream is that which rises to the top when a quantity of milk is left undisturbed ("set") for a few hours.

Centrifugal cream is separated from milk by centrifugal force, applied by means of a device called a "centrifuge," which removes almost all the fat. The violence to which the cream is subjected in this operation sets some of the fat globules free; that is, destroys the emulsion, though only to a slight extent. On this account, centrifugal cream is somewhat less digestible than gravity cream, but the difference is not very great, probably. The emulsion, unless completely broken down, is partially restored if cream is left undisturbed for a sufficient length of time.

Different varieties of cream, of which there are a great number, are named, each according to the amount (percentage) of fat that it contains; thus, 8 per cent cream contains 8 per cent of fat; 16 per cent cream contains 16 per cent of fat; and so on, up to 60 or 80 per cent cream.

The fat-value of cream is different at different levels, the upper levels being much richer than the lower levels, always; to take off a few tablespoonfuls of cream from the very "top of the bottle" of milk that has stood for a few hours is to remove a very considerable part of the whole

quantity of fat. Milk yields, by gravity, a certain definite quantity of each variety of cream, when the cream is dipped from the top of the bottle after it has risen; for example, the top four ounces taken together contain 20 per cent of fat; the top eight ounces together contain 12 per cent of fat, etc. The strength of cream does not increase materially after it has separated; the thickening on standing is due almost entirely to the growth of bacteria, which rise with the fat. This explains why cream "sours" sooner than milk under the same conditions.

As the fat-value of cream increases there is corresponding decrease in the quantities of proteins and sugar; that is, the richer the cream in fat, the poorer it is in the other vital food elements.

MILK

There are three varieties of milk that may be employed in the preparation of substitute food:

1. "Whole" milk, from which no fat (cream) has been removed.

2. Skim milk, from which a part, or all the gravity cream has been taken.

3. "Fat-free" milk, from which the cream has been separated by the centrifuge. ("Fat-

free" milk, however, always contains a small quantity of fat.)

It is of very great importance that the milk to be employed as a substitute food should be suitable; uniform in character and quality, and "clean."

The milk of the Jersey and Guernsey cows is peculiarly unfit for substitute-feeding: (1) because it contains exceptionally large amounts of the irritant fatty acids; (2) because the emulsion is easily destroyed. Among the breeds of cows that give suitable milk are the Ayrshire, the Durham, the common red cow, and the Holstein, though Holstein milk may be somewhat deficient in fat; *i. e.,* contain less than the 4 per cent that is required by law in many, if not in most, states of the Union.

Apart from its suitability, which depends upon the breed of the cows, the fitness of milk for this, or indeed for any food purpose, depends upon the care and feeding of the animals themselves; upon the dairymen and the dairy methods. Abusive treatment, or the fear of it, through its effect upon the nervous system of the animals, impairs the quality of the milk; even its composition—the actual percentages of fat, proteins, and sugar—may be changed by a beating.

The chemical changes that take place in milk —souring, for example—are due to the action of minute (microscopic) vegetable organisms—little plants known as bacteria, of which there are a great many varieties. Some of them, but fortunately only a few, are disease germs; that is, they operate in the body as specific causes of disease, or of certain diseases—of which diphtheria and tuberculosis (consumption) are examples. At ordinary degrees of warmth, as between 70° and 100°, bacteria grow very rapidly in milk, doubling in number every twenty minutes. Varieties that are harmless of themselves, if allowed to increase in numbers beyond certain defined limits, make milk unfit for use, and even poisonous, through their power to set up the chemical changes (fermentations) referred to. Sour milk, however, is neither harmful, nor unhealthful as food. By taking extraordinary precautions, it is possible to produce a small quantity of milk that is absolutely free from bacteria; but these little organisms are everywhere present in the air, and they are found even in the cow's udders. It is therefore practically impossible to exclude them altogether from milk, and indeed quite unnecessary, for the commoner varieties do harm only when present in very large numbers.

Milk that is comparatively free from bacteria is said to be "clean," and only "clean" milk is fit for any food purpose. As all bacteria are heavier than air, they settle everywhere that dust settles; an atmosphere filled with dust is always filled with bacteria, also. Accordingly, milk cannot be clean if the cow stable and the cows are not clean, or if the milkers are dirty; if all utensils, from milk pails to milk bottles, are not thoroughly washed and scalded as often as used. And the best milk may be made unfit for use—unclean—through ignorance of right methods of care and handling.

Since it is practically impossible to keep the common varieties of bacteria out of milk wholly, it is necessary to do one of three things that it may not be rendered unfit for food purposes within a very short time: (1) destroy them; (2) suspend their activities; (3) retard their growth, that they may not increase in numbers beyond a certain limit. (In many parts of the country this limit is defined by law.)

All bacteria—including disease germs of course—are destroyed by exposure to a high degree of heat—212°, the temperature of boiling water, is sufficient—for half an hour. Food substances, utensils, anything thus treated is "sterilized"; sterilized food substances in steril-

ized receptacles will keep without chemical change, under all conditions of temperature, as long as air is excluded from them.

The activity of bacteria is wholly suspended for a time by exposure to a much lower degree of heat—155° maintained—for half an hour. Milk thus treated is said to be "pasteurized." Pasteurized milk, in clean, well-stopped bottles, kept at a temperature not above 50°, undergoes no change for three or four days.

Continued cold—a temperature of 50° or lower—retards the growth of bacteria. Clean milk, at a temperature not above 50°, will remain sweet for two or three days without pasteurization.

It should be remembered, however, that neither pasteurization nor cold destroys bacteria; an intense degree of cold, and long-continued exposure thereto, only suspends their activity, which, under favorable conditions—heat, moisture, and a suitable soil—may be renewed.

But since the presence in milk of a few bacteria of the "harmless" kinds does not injure it—indeed, some varieties are useful; and since, as we shall see, the value of raw milk as a food for continuous and sole use depends upon its being *fresh,* it is sufficient in this case to limit their growth, and for this purpose a moderate

degree of cold is effective. This limitation of growth, however, is absolutely essential to clean milk.

All milk, therefore, ought to be cooled to a temperature of 50° as soon as may be, but always within fifteen minutes after the milking, and it should be kept at this temperature—50° or lower—until it is to be used.

When milk properly cared for "sours" within twenty-four hours from delivery, either it was not fresh, or it was not clean at that time. (The souring of milk commonly attributed to a "thunder shower" is explained by the fact that the atmospheric conditions—heat and moisture—that accompany thunder storms are favorable to rapid growth of the bacteria to which the souring is due, but this does not take place unless the temperature of the milk is above 50°.)

Milk employed as a substitute food must be fresh as well as clean, the fresher the better; for this reason, morning's milk and "nearby" milk should be preferred always, other things being equal. In the case of the adult, the importance of fresh food—animal or vegetable—is shown, negatively, in the development of scurvy—a disease due to imperfect nutrition—among sailors whose diet has been limited to salted meats and other preserved articles of food—

canned or tinned vegetables and fruits. The same disease—scurvy—often appears in infants who are deprived of fresh milk for any length of time. In or of what this essential property, freshness, consists we do not know; the fact that in milk it is destroyed by heat suggests that, in this case, it may depend upon some vital principle, or organism, to which high temperatures are fatal.

Many dairies of the first class furnish special "baby milk"; that is, milk that is fresh, clean, uniform in character and quality, and suitable for artificial feeding. Usually an increased charge is made for "baby milk"; but it costs no more to produce than any "clean" milk, and should be made available everywhere at the same price. A demand for it would doubtless create a supply in every community.

WHEY

Whey is milk from which the cheese principle—casein—has been removed. This is accomplished by the addition of rennet, or its equivalent preparation, by which the casein is formed into a curd or curds. The clear liquid that remains after the removal of the curds, by straining, is whey. Whey may be obtained from whole milk, or from skim milk; in any case, it

must be heated for twenty minutes at a temperature of from 145° to 150°, in order to destroy the activity of the rennet, or other preparation, employed to curdle the casein. Unless this precaution is taken, the cream, or milk, will be curdled when combined with it. Care must be taken, however, that the temperature is not raised much above 150°; at 155° the whey would be pasteurized, and at 158° whey-proteins are curdled, just as white of egg is curdled by heat.

The fat-percentage of whey depends both upon its source and the method of preparation. If the curd is not broken up, or disturbed in any way before its removal, most of the fat in the milk will be separated with it, and the whey will contain only a very small quantity (about one-third of 1 per cent—0.32 per cent); by breaking up the curd and thoroughly shaking curds and whey before separating them, it may be made to contain about 2 per cent of fat. Whey thus prepared (from whole milk) is known as "2 per cent whey." Whey prepared from skim milk contains practically no fat, and is called, accordingly, "fat-free whey." Each variety of whey contains a little less than 1 per cent of proteins (whey-proteins) and nearly 5 per cent of sugar (milk containing about 0.60

per cent of whey-proteins and 4.50 per cent of sugar).

In the cases of infants who are unable to digest mixtures of cream and milk, the so-called "whey-cream" mixtures may be employed with advantage.

For combination with cream, or with cream and milk, whey may be prepared most conveniently from skim milk; generally, a sufficient quantity of skim milk for the purpose may be obtained from a single quart of milk. Directions for the preparation of "whey-cream" mixtures are given elsewhere.

MILK–SUGAR

As the word implies, milk-sugar is derived from milk. Only the recrystallized sugar should be used; the commercial article has been found to contain large numbers of bacteria. Cane-sugar may be used instead of milk-sugar, to which it is equivalent in nutritive value. But cane-sugar is liable to ferment in the stomach, and on this account is objectionable in many cases, though it appears to agree with some infants perfectly well. Milk-sugar, however, has certain advantages, by reason of its chemistry, which make it generally more suitable.

LIME WATER

Lime water has been employed as a modifying agent for many years, mainly for two purposes: (1) to correct the acidity of cows' milk (cows' milk, however, is not always acid, but normal breast-milk is always alkaline); (2) to render the casein of cows' milk more digestible. Discussion of the action of this and of other chemical agents that are sometimes employed in the preparation of artificial food would be manifestly out of place here; it must be sufficient to say that a small quantity of lime in the food is believed to be of service in itself as furnishing material for the development of the bones from cartilage, while the usefulness of lime water as an aid to the digestion of milk is attested by well-nigh universal experience.

To insure alkalinity of the food, 5 per cent of lime water—1 ounce to 20 ounces (1¼ pints); or 1 drachm (a teaspoonful) to each 2½ ounces of food—is sufficient, though two or three times as much may be used in certain conditions.

Lime water is prepared by adding freshly slaked lime to pure cold water. An excess of lime—that is, more than the water will dissolve—must be used; and this excess, which appears as a white powder at the bottom of the containing vessel, must be maintained that the constant

loss of strength from exposure to air may be constantly made good. As freshly slaked lime is required, lime water should be prepared in small quantities—a pint—at a time, as follows: Put a small lump (an ounce) of lime in cold water sufficient to slake it—convert it into a white powder, which settles to the bottom of the vessel; then pour off the water, and add a sufficient amount of the powder to a pint of pure cold water; shake thoroughly, and put aside in a tightly corked bottle. Water dissolves only a very small quantity of lime.

CEREAL WATERS

All cereals contain starch; but the quantity in these preparations is very small, and would add but little to the nutritive value of the food, even if it could be digested by the infant. And cereal water is not employed to this end, but because a small quantity of starch in the milk serves mechanically to prevent in a measure the formation of dense curds of casein in the stomach, and assists their breaking up. Barley water is the most generally useful; in cases of constipation, oatmeal water should be substituted. The presence of a small amount of starch in food assists the action of the gastric juice also. Barley and oatmeal water, respectively,

are prepared by adding two tablespoonfuls of washed pearl barley—or of oatmeal, as the case may be—to a quart of cold water, which should then be boiled down to a pint, strained while hot, and at once set aside in a covered dish to cool. A little salt should be added.

Plain water is as often used as the diluent; it should be "pure," of course—within the meaning of the word for table use. The purity of the "spring water" that is furnished in bottles, or brought to our houses in carboys, depends quite as much upon the care that is taken in the handling as upon the witness of the chemist who makes the analysis. A pure water at its source may be made unfit to drink by filthy habits, or by ignorance and carelessness on the part of the men employed to bottle and deliver it. Disease germs and chemical impurity cannot be detected by the eye, or by the taste, or by the smell. Water may be "clear as crystal" and conceal typhoid fever; it may be discolored, offensive to smell and taste, but harmless when taken into the stomach. Water from the tap is more likely to be safe than either spring water or well water of which the quality is unknown. But water from any source may be sterilized by boiling it for half an hour; and unless it is of known purity, this precaution should be taken.

CHAPTER VI

Substitute-Feeding — Home Modification of Milk — The Preparation of the Food — Tables

WE have now considered each of the materials usually to be employed to make cows' milk suitable for artificial feeding. When the composition of milk has been changed by admixture with any or with all of them, or even by simple dilution with water, it may be said to have been "modified"; though the term, "modified milk," is often, perhaps usually, employed in a restricted sense to denote the products of the milk laboratory, or mixtures of cream, milk, etc., that more or less closely resemble them. These laboratories, which have been established and are in successful operation in all our great cities, furnish modified milk containing definite quantities (percentages) of fat, proteins, and sugar on prescription, just as the pharmacist fills prescriptions for mixtures of drugs. The physician writes down the exact percentages of the food elements that in his judgment are indicated, the number of daily feedings, and the quantity of food to be given at each feeding. The prescription is sent to the

laboratory to be filled accordingly. Laboratory milk is delivered in nursing bottles—each containing a sufficient quantity for a feeding; packed in suitable containers for transportation, it is sent long distances. This service is said to be very satisfactory—and expensive. The milk used in the laboratories is supplied by dairies that are under the same management; it is, therefore, "clean" milk. Accordingly, laboratory milk, properly cared for, will keep perfectly sweet for several days without pasteurization.

But the "modified milk" of the laboratories is by no means essential to successful substitute-feeding. The modifying agents employed in its preparation—milk-sugar, lime water, cereal waters—are readily obtainable, as we have seen; and if suitable milk is available, as it is in many communities, and should be everywhere, home modification may be made with quite as good results. Indeed, gravity cream and whole milk are to be preferred to the centrifugal cream and "fat-free" milk that are now employed exclusively in the milk laboratories; and to this extent the home product, prepared according to the instructions to be given, is superior to the product of the laboratory.

Manifestly, if the analysis—the fat, protein,

and sugar values (percentages)—of the materials employed is known, mixtures containing definite percentages of the nutritive elements may be made by combining these materials in proper proportions. This is what is meant by "percentage modification" and "percentage mixtures."

This accurate knowledge of food values enables us to adjust the food to individual needs and conditions with the least possible delay and the greatest possible precision, while it reduces the risk of under-feeding to a minimum. But the use of "fat-free" milk—in itself troublesome—and of a variety of creams, ranging from 8 per cent to 32 per cent or more, necessarily involves so much confusion that accurate modification, outside the laboratory, has been very generally regarded as impracticable.

There is, however, no advantage in the use of the richer creams, or of a variety of creams. And if, instead of "fat-free" milk, whole milk is employed as the basis for the preparation of the food, only a single variety of cream is necessary; and a single quart of milk yields enough, by gravity, for the preparation of the daily food for the infant at all periods, up to the age of ten or twelve months, and under all conditions.

If, for any reason, richer cream (than the

top 6 ounces) is desired, the top 4 ounces only should be taken from the quart of milk; this contains 20 per cent of fat. Cream containing 16 per cent of fat may be obtained by mixing 3 parts of 20 per cent cream with 1 part of milk; thus 4 ounces of 20 per cent cream, mixed with 1⅓ ounces of milk, is equivalent to 5⅓ ounces of 16 per cent cream.

Finally, centrifugal cream containing practically any desired percentage of fat may be ordered from most large dairies of the best class. Cream always contains a larger number of bacteria than milk from the same source and under the same conditions; it is the more important, therefore, that it should be fresh, clean, and properly cared for.

Milk that contains less than 4 per cent of fat is below the standard fixed by law in most localities. But "poor" milk—*i. e.,* deficient in fat—is not necessarily unfit for substitute-feeding. The milk of Holstein cows, for instance, which is perfectly suitable for the purpose in other respects, often contains less than 4 per cent of fat. "Poor" milk does not yield so large a quantity of adequate cream, though its quality may be quite as good; for example, milk that contains 3.50 per cent of fat yields but 5 ounces (instead of 6 ounces) of adequate cream. Ac-

cordingly, if the milk in use is "poor," the top 5 ounces (if very "poor," the top 4 ounces) instead of 6 ounces, should be removed from the quart set for cream. If this quantity is insufficient, an extra pint of milk should be set in a suitable vessel—as a pint fruit jar—of which the top 2½ ounces (or 2 ounces), after 8 hours, should be taken and mixed with it. Five ounces of gravity cream from a quart of "poor" milk (or 4 ounces from very "poor" milk) represents about the same amount of fat as 6 ounces from a quart of standard milk. This is explained by the fact that cream grows richer as it nears the surface.

Unless the analysis of the milk is known, the fat-value of the cream therefrom cannot be estimated so closely, of course; but cream thus obtained from "poor" milk may be used with very satisfactory results if standard milk is not available. And "poor" milk does not itself contribute to the food so much fat as standard milk; allowance may be made, accordingly, by using a little more cream and correspondingly less milk in the preparation of the food. The difference is so small, however, that it may be disregarded usually.

And there is no advantage, and but very little economy, in the use of skim milk, or of "fat-

free" milk, in the preparation of the food—since, except for the youngest infants, a sufficient quantity of fat and proteins for a day's feeding cannot be obtained from one quart of milk. Two quarts of milk a day, however, will furnish both cream and milk enough for the infant from the beginning to the end of the usual period of substitute-feeding, and will provide for the ordinary family, too; that is, the food having been prepared, there will be left from the two quarts, from about 3⅔ pints in the beginning, to about a quart at or near the end of the period. Except for the loss of a small portion of fat (from about 1 to about 1½ per cent), this residue is as nutritious as whole milk, and quite as useful for most domestic purposes.

With milk at ten cents a quart, the cost of the cream and milk consumed by the infant ranges from two cents to twelve cents a day. Modified milk, therefore, if prepared at home, is at once the best and least expensive substitute food.

EQUIPMENT

		Capacity
1 large pitcher, for mixing the materials		2 qts.
1 small pitcher, for the cream		8 oz. (½ pt.)
1 glass graduate, for measuring liquids		8 oz.
1 sugar measure		½ oz.
Nursing bottles, 3 sizes	10 small	3 oz.
	8 medium	6 oz.
	6 large	10 oz.

1 round-bottomed cream dipper.
1 glass funnel, for filling bottles.
1 roll of prepared (aseptic) cotton wool, for stopping the nursing bottles.
1 thermometer.

The ordinary kitchen equipment is usually sufficient for pasteurization, etc.

Liquids are measured most conveniently in ounces—called fluid ounces—and in fractions of an ounce.

The values of the common domestic measures, which, of course, vary considerably in size, are shown in the following table:

1 quart = 32 ounces.
1 pint = 16 ounces.
½ pint = 8 ounces.
1 tablespoonful = ½ ounce.
1 teaspoonful (small) = ⅛ ounce = 1 drachm (fluid).

Milk-sugar may be measured in a tablespoon—a level tablespoonful contains a little less than half an ounce; but a sugar measure is very much better for the purpose—one holding half an ounce when even full is of convenient size. It may be purchased, or improvised by putting a sample half ounce of milk-sugar—weighed out by the druggist—into a small glass, and marking its upper level by a narrow strip of paper, or cloth, pasted on to the outside of the glass; divisions into quarter and eighth ounces

may be indicated in the same way. A small pasteboard box may be used instead of a glass. Or, the milk-sugar may be purchased in half ounce and ounce packages.

Cotton wool makes the best stoppers for nursing bottles, because bacteria cannot get through it. Absorbent cotton is equally protective, but its absorbent property renders it unsuitable for this purpose.

THE PREPARATION OF THE FOOD

Two quarts of milk should be provided daily from the outset—one for the supply of the cream, the other to supply the milk required. Practically all the cream that can be obtained by gravity from a quart of milk rises in 8 hours, and when the milk is "set" in a suitable vessel—as a quart milk bottle—is represented in the top 6 ounces. This quantity will not be required always; but as the fat-value of cream is different at different levels, the entire 6 ounces must always be removed and well "mixed"—otherwise the strength of the cream employed from day to day will not be uniform, and accuracy in making the modifications will be impossible.

The whole quantity of cream obtainable cannot be poured from the top of a bottle,

much less skimmed from milk set in a basin, without admixture with milk; a cream dipper, therefore, is indispensable. With a round-bottomed cream dipper the entire 6 ounces may be removed, practically free from skim milk.

Milk should be delivered daily, in bottles always, and at such time that it may be cared for without delay; exposure for any length of time to ordinary atmospheric conditions of heat and cold seriously affects its value, for substitute-feeding particularly. Even at a temperature of 60°, bacteria grow rapidly in milk; freezing, on the other hand, breaks down the emulsion—and the top milk (cream) always freezes first, rendering the fat less digestible. Moreover, the expansion of cream and milk caused by freezing forces the stoppers from the bottles, exposing their contents to accidents of various kinds.

As soon as the milk is delivered, therefore, one of the quart bottles should be set aside in a cold place, on or near ice, or in a mixture of ice water and salt, in order to obtain the required cream. If the milk is delivered in bulk, a quart milk bottle, or a quart fruit jar, should be filled, tightly covered, and "set" for cream under the same conditions.

From the second quart, after it has been

poured out into a pitcher—to "mix" it—the required quantity (number of ounces) of milk should be taken, and also set aside to be kept cold until needed.

At the end of the 8 hours required for the cream to rise—earlier, if it had risen partially when the milk was set, and preferably within the next 2 or 3 hours—the food should be prepared as follows:

1. Remove, with the cream dipper, the top 6 ounces from the quart of milk set for cream (it is usually best to dip out the very top cream with a teaspoon) and put it into a small pitcher (to "mix" it); from this 6 ounces take the required quantity of cream and pour it into a mixing pitcher.

2. Add to the cream the milk that has been reserved.

3. Measure out and dissolve the milk-sugar in a small quantity of the diluent—water, or barley water, etc.—and add it, together with the rest of the water, or barley water, to the cream and milk. (As the sugar is completely dissolved, it does not increase the total quantity—number of ounces—of food.)

4. The lime water may be mixed with the food at this time; or it may be reserved, to be added—usually in the proportion of one tea-

spoonful to each 2½ ounces of the food—to each feeding just before it is given.

5. Mix these materials together; divide the mixture into as many equal portions as the child requires feedings in 24 hours—putting each into a separate nursing bottle; plug each nursing bottle with a wad of cotton wool, and put them all aside in a cold place, to be kept until the food is required.

Food for the infant in health may be prepared in this way, day after day, from week to week, through the whole period of substitute-feeding, with no variation except that as the child develops, the *quantities* of the materials must be changed from time to time to meet the changed requirements; this, however, involves no change in method or manipulation.

STERILIZATION AND PASTEURIZATION

Under certain conditions, viz.: if the milk in use is old; if it is not clean; if the food cannot be kept cold; or if a quantity must be prepared from one to several days in advance, as, for instance, in provision for a long journey —conditions that should be of exceptional occurrence only—the food should be either sterilized or pasteurized. But sterilization, as we have seen, destroys the essential *freshness*

of the milk, in which it produces certain chemical changes, also. Sterilized milk is less easily digested than raw milk, and very generally causes constipation. The records show that infants who are fed wholly upon it for considerable lengths of time are especially liable to scurvy.

It is probable that pasteurization impairs the nutritive value of milk in the same way, or in similar ways, though to less extent and in less degree. But pasteurized milk should not be employed continuously as a substitute-food. Under the conditions named, however, both sterilization and pasteurization are of great service; and they may be absolutely necessary to prevent or to control disorders and diseases of the digestive organs. The choice between them should be determined by the circumstances, or the particular requirements in each case.

The food is made sterile by exposing it to live steam (steam at the temperature of boiling water, 212°) for half an hour. If milk containing considerable amounts of milk-sugar and lime water is heated to this degree, a caramel is formed which turns it brown. This discoloration does not appear to injure the food essentially; but it may be avoided by omitting

lime water in the preparation of the food. In this case a sufficient quantity of lime water should be added to each feeding just before it is given. Except that it is somewhat troublesome, it is better to employ lime water in this way always, whether or not the food is sterilized or pasteurized.

The food should be sterilized in the nursing bottles, which, preferably, should be boiled or baked for half an hour in advance. Arnold's Steam Sterilizer is perhaps the most convenient apparatus for the purpose; but other sterilizers may be purchased, and an ordinary steam cooker, or a deep kettle fitted with a tight cover, serves perfectly well. If a kettle or "steamer" is used, the bottles containing the food should rest upon a perforated support just above the level of the boiling water, and the steam that is generated should be confined about them; and as round-bottomed nursing bottles are the only fit ones, they must be supported in an upright position in a rack, which may be easily improvised from a wire basket. The nursing bottles should not be more than three-quarters full, and each should be well stopped with a plug of cotton wool.

Ordinarily, the purposes of sterilization are served by heating the food for half an hour

at from 170° to 175°, which destroys all bacteria. Generally, for this purpose, the temperature should not be raised above 175°; at 177° certain chemical changes take place in milk which it is desirable to avoid. But in hot weather, or if the food cannot be kept cold until it is needed, and in cases of diarrhœal diseases, the higher temperature, 212°, should be employed.

The process of sterilization, and of pasteurization, is a very simple one: Put a sufficient quantity of water into a kettle, or "sterilizer," and heat it to the required degree; immerse the partially filled nursing bottles to the upper level of the milk, and allow them to remain for half an hour. During this time, a very nearly uniform degree of heat should be maintained; if the food is to be absolutely sterilized, a temperature of 212° is necessary, *i. e.,* the water must be kept boiling; if it is sufficient, as it is usually, that the bacteria in the food should be destroyed, the temperature should be kept between 175° and 170°; if only pasteurization of the food is desired, the range of temperature should be from 155° to 145°. If milk is heated to 158°, the whey-proteins are curdled and made less digestible.

If sterilized milk causes constipation, a

small quantity—from one-quarter to one-half teaspoonful, more or less, according to the age and the need—of "maltine" may be added to each feeding; or "maltine with cascara," in smaller doses, may be given with every other feeding (that is, three or four times in the 24 hours), either mixed with the food or separately. The latter preparation is slightly bitter, and may make the milk objectionable to the child's taste if mixed with it.

Boiled milk, that is, milk boiled in an open pot or kettle, has all the disadvantages of sterilized milk, without its advantages; it does not "keep" so long as pasteurized milk usually, and is much less digestible.

If the milk in use is visibly dirty, and therefore necessarily filled with bacteria, it should be strained by placing a pledget of cotton in the stem of a funnel and pouring the milk through it; this will not only remove the gross impurities, but large numbers of the bacteria, also. But such milk is utterly unfit for food purposes, of course, and should not be used without sterilization, save from necessity.

"WHEY–CREAM" MIXTURES

The so-called "whey-cream" mixtures may be very useful in cases of feeble digestive

powers, as in the feeding of the premature infant, or when from any cause the digestion of the casein of cows' milk is difficult. They are not required for the feeding of the normal infant in health; and, generally, are to be employed only by and under the immediate direction of the physician.

Whey, as we have seen, contains the whey-proteins only—no casein. As these proteins are not curdled by rennet or by acids, they do not form curds in the stomach, and are therefore more digestible than casein. By replacing milk with whey, wholly or partially, mixtures containing a sufficient quantity of fat with a small percentage of casein and a relatively large percentage of whey-proteins may be obtained. Generally, except for very young infants, the highest attainable percentage of whey-proteins is indicated in these mixtures; this is obtained, of course, by adding the largest possible quantity of whey; that is, by using whey as a diluent, in place of water or barley water, etc.

The 26 ounces of skim milk that remain after 6 ounces of cream have been taken from a quart of milk will yield about 20 ounces of whey. As the skim milk contains only a small amount of fat—from 1.00 to about 1.25 per cent—whey therefrom is practically free from fat.

Whey is prepared by adding liquid rennet, or Fairchild's Essence of Pepsin, to whole milk, or to skim milk, in the proportion of two teaspoonfuls of either to each pint of milk. The milk must be lukewarm (at a temperature of 100°) when the rennet or pepsin is added. As soon as the curd is formed, it should be separated by straining the mixture through cheese cloth. Afterwards, as already noted, the whey must be heated to a temperature of 150°—or between 145° and 150°—to destroy the activity of the rennet or pepsin. The temperature must be kept closely within these limits.

GENERAL PRINCIPLES

We have now to inquire as to the principles to be derived from the facts that we have learned, and their application to the preparation and use of substitute-food.

At birth the stomach holds, without distention, about one fluid ounce (two tablespoonfuls), and throughout the earlier periods of infancy its capacity is small; thus at the age of four weeks it is about 2½ ounces; at two months, about 3½ ounces; at five months, about 5 ounces. The walls of the stomach are very easily stretched, however, so that it may be

made to contain very much more than its normal capacity at different periods.

In our discussion of the processes of digestion, the "churning movement" of the stomach, which depends upon the alternate contraction and relaxation of the different sets of muscles of which its walls are mainly composed, was referred to; in the case of the bottle baby this movement is peculiarly important, if, indeed, it is not absolutely essential to the sufficient digestion of the casein of cows' milk, which differs from that of breast-milk in that it forms large, dense curds upon reaching the stomach, while the latter forms soft, flocculent, and therefore readily digestible curds. But the tough curds of cows' milk are soon broken up by the "churning" of which the stomach is capable, so that the gastric juice is able to penetrate and dissolve them. If, however, the walls of the stomach are distended, it is clear that their muscular power will be correspondingly diminished, and may even be lost altogether.

It follows that the amount of food, particularly of substitute food, should be limited to the stomach capacity, and that beyond this limit deficiency in strength cannot be made up by increasing the quantity. In the case of the nursling, these muscular movements are not so im-

portant, as the casein of breast-milk forms very soft curds in the stomach; its distention, therefore, does not interfere so much with digestion.

The small capacity of the stomach furnishes one of the reasons why the strength of the food in early infancy should be adjusted as closely as may be to the actual requirements of nutrition. While these requirements are different for different individuals—and there is always the exceptional case to be provided for—they differ for the great majority of infants within limits that have been pretty well defined. We know that food for continuous use must contain a sufficient amount of each of the food elements. To determine, theoretically, what this sufficient amount is, it is necessary to consider the especial nutritive office of each: that fat supplies heat (and energy); sugar, energy (and heat); that proteins, and proteins alone, furnish material for the growth and repair of the tissues. But our theoretical mixtures must be subjected to the test of experience; for example, while fat is essential to nutrition, we have learned by experience that mixtures containing only a small quantity of fat may be given for a considerable length of time without materially impairing the infant's nutrition. In certain

conditions infants may be fed on skim milk, or fat-free milk, for several weeks, and make continuous gain in weight meanwhile; but if proteins are withdrawn, or if the quantity is decreased below certain limits, even if the food contains an excess of fat, nutrition at once suffers—the child practically ceases to gain in weight, becomes pale and weak, and is ravenously hungry. While, therefore, proteins may be regarded as the most important food element, in the sense that they cannot be left out, or even reduced in quantity, for any length of time, they do not make up for deficiencies of fat and sugar, unless given very largely in excess—far beyond the need of the body for building material; and an excess of proteins not only disorders digestion, but burdens unequally the organs of excretion, particularly the kidneys, by which most of the protein waste is removed from the system. We are, therefore, brought back to our original proposition that the food should be well balanced, contain enough fat, enough proteins, enough sugar, and not more than enough of each of these elements.

While no absolute rules can be laid down —even for the feeding of the infant in health— careful study and long experience in the use

of substitute food have established certain averages as to the quantities of food required, the amounts to be given at each feeding, the percentages of the food elements that are suitable, etc. These averages are shown in the tables, which for convenience of reference are grouped at the end of the chapter.

USE OF THE TABLES

The tables are to be used as a guide and as a basis for the preparation of additional mixtures. To facilitate their use for these purposes, the nutritive value of each of the mixtures tabulated is stated in terms of percentages.

Average mixtures, or mixtures suitable for the average normal infant in health, are shown in Table II. The percentage of fat in each of these mixtures may be decreased, or increased, without materially affecting the percentages of proteins and sugar, by changing the proportions of the cream and milk employed. This depends, of course, upon the fact that the cream and milk contain about the same amount both of proteins and of sugar. For example: mixture No. IV calls for 4 ounces of cream and 5 ounces of milk; if we change the proportions of the cream and milk by using 3 ounces of cream and 6 ounces of milk, the quantity of fat will be reduced from 3.50

to 3.00 per cent; on the other hand, by using 5 ounces of cream and 4 ounces of milk, the fat will be increased from 3.50 to 4.00 per cent. The exchange of 2 ounces of cream and milk decreases, or increases, the fat by 1.00 per cent. In each case, the percentages of proteins and of sugar remain substantially the same.

In the same way, practically any desired percentage of fat may be obtained with each of the tabulated percentages of proteins and sugar; for example, suppose the infant requires 1.50 per cent of proteins, but is unable to digest the usual amount of fat. In this case, we select the mixture that contains the proper percentage of proteins (No. VI); reduce the quantity of cream by 1 or 2 or 3 ounces, as needful, and correspondingly increase the quantity of milk.

In mixtures of 24 ounces, each ounce of cream and milk exchanged decreases, or increases, the fat by 0.50 per cent; in mixtures of from 30 to 40 ounces, by about 0.35 per cent.

With the table as a basis, therefore, a great number and variety of modifications may be made merely by changing the proportions of the cream and milk in the tabulated mixtures—enough to meet every requirement of the infant in health. And as the fat is most frequently responsible for disturbances of digestion, the nec-

essary modification in many cases of indigestion may be made in the same simple way.

We are not to suppose, however, that our mixtures, even very carefully prepared, will contain the exact percentages that are indicated by the formulas, though with standard milk in use the error should be small, and with milk of uniform quality, tolerably constant; but essential accuracy is always attainable. Apart from "adapting" the food—individualizing it—the "percentages" are important solely on account of the relationship between strength and daily quantity. Nutrition requires not only, or merely, that the food shall have sufficient nutritive value —as nutritive value is commonly measured; it must contain enough, and, in the case of the bottle baby particularly, not more than enough of each of the food elements. And to these ends, in view of the deficiencies in the infantile powers of digestion, of the limited capacity of the stomach, in early infancy especially, and of the importance of adjusting the food to individual needs, percentage modification furnishes at once the surest and the safest and the simplest means.

As foods in general are measured (by calories), the mixtures shown in Table II, with the exception of the first, have about the same nutritive value as cows' milk (which is almost pre-

cisely equal to breast-milk). In arriving at the daily quantity—number of ounces—of food required, therefore, cows' milk may be taken as the standard of value.

There is no single perfectly reliable guide to the quantity of food required in the twenty-four hours, which must be determined finally by the sum of the indications in each case; the age is one, of course—the most convenient one and, therefore, the most generally employed for practical purposes, though its value depends mainly upon the usual correspondence between age and weight. But this correspondence sometimes fails. And the infant that weighs 15 pounds at four months needs as much food as another of the same weight at the age of six or seven months. Accordingly, the weight is the best index of the requirement in this respect, allowance being made for over-weight from too much fat, and for under-weight by reason of illness, or imperfect nutrition.

In early infancy, when normally the gain in weight is most rapid, more food comparatively is required. Up to the age of five or six months a daily allowance equal to about 2 ounces of milk for each pound of the body weight should be made; above this age, 1¾ ounces of milk for each pound of the weight is sufficient. Larger

daily quantities than these are seldom required, and many infants thrive on smaller quantities; but a daily allowance less than 1½ ounces of milk for each pound of the weight does not provide sufficiently for the normal gain in weight, usually. Accordingly, for example, an infant at two months, weighing 10 pounds, should have about 20 ounces of food (modified milk), and not less than 15 ounces, a day; at seven months, weighing 17 pounds, about 29 ounces, and not less than 25 ounces a day. But, if the infant is making continuous and satisfactory gain in weight, and is well, the daily quantity of food, however small, should not be increased to meet indications of age or weight. (In preparing the food, it is best to adhere to the quantities called for in the table, which are most suitable as bases for the preparation of additional mixtures.)

The risk of over-feeding is quite as great as that of under-feeding, and the consequences may be quite as serious. In these cases, either the quantity of food or the strength may be at fault. Among the evidences of over-feeding are sudden abnormal gain in weight (10 or 12 ounces a week), disorders of digestion, and loss of appetite. The weight soon becomes stationary, or declines. The bowels are constipated. The dejections, losing their natural appearance and

character, become grayish white in color, dry, and crumbly, scarcely staining the diapers; or they are of the consistency of putty. Itching eruptions and eczema are frequent events. In some cases, particularly in hot weather, very serious illness, attended by symptoms that suggest cholera infantum, is rapidly developed.

If over-feeding is recognized early and the food at once modified, normal conditions will be speedily restored. It may be necessary to reduce both the quantity and the strength of the food—particularly the percentage of fat; less frequently, the amount of sugar must be decreased. But in cases of chronic over-feeding, evidenced by the change in the appearance of the dejections, etc., and especially in event of sudden acute illness from this cause, milk should be at once withdrawn and absolutely withheld for at least twenty-four hours; meanwhile, nothing but barley water, sweetened with saccharin (one grain to the quart), should be given, though the child will not suffer in any respect if only water is allowed for this period. Generally, no other treatment is required.

After the age of two or three months, at any rate, the necessary modifications may be made without reducing the nutritive value of the food below that of cows' milk.

In determining the strength of the food for the individual—the quantities (percentages) of each of the food elements required—the special nutritive uses of each should be borne in mind: that proteins, and proteins only, supply material for the growth of the body; that fat and sugar furnish heat and energy. Accordingly, the rapidly growing infant needs more protein than one that grows less rapidly; the more active require more food, and, particularly, more sugar and more fat than the less active, while the sluggish or phlegmatic infant, especially if there is a tendency to undue accumulation of fat, should have less food and, particularly, less fat in the food.

It is clear, as we have remarked, that no absolute rules can be laid down, even for the feeding of the infant in health. There are, however, certain principles by which one may and should be guided in adjusting the strength of the food to the needs of the individual; some of them have been stated, but for convenience of reference they are grouped:

1. The infant does best upon the minimum quantity and strength of food necessary for nutrition.

2. Since proteins, and proteins alone, provide material for the growth of the tissues, a

deficiency of protein cannot be supplied by giving an excess of fat and sugar.

3. The use of mixtures containing less than 1½ (1.50) per cent of proteins—or, in terms of cream and milk, less than about 7 ounces of cream and milk combined to each pint (16 ounces) of food—is under-feeding for most infants after the age of two or three months.

4. More than 4 per cent of fat is not required for nutrition.

5. The ratio of fat to proteins in the mixtures ordinarily to be employed in the feeding of the normal infant in health, should not exceed 3 to 1; that is, with a suitable percentage of proteins more than three times as much fat is not required; on the other hand, with a suitable percentage of fat the child needs at least one-third as much proteins.

6. The ratio of fat to proteins should decrease with the development from 3 to 1 in the beginning to about 1⅓ to 1 at or near the end of the usual period of substitute-feeding.

Only the food that is digested and absorbed goes to the nutrition of the body. Undigested food in the stomach, or intestines, is very apt to cause trouble unless speedily expelled; vomiting and diarrhœa are often only the efforts of nature to get rid of undigested or indigestible food.

The food may be regarded as suitable:

1. If it is not rejected by the stomach.

2. In the absence of symptoms of indigestion—vomiting, colic, diarrhœa, etc.

3. If the discharges from the bowels are natural in appearance and free from lumps, "curds," mucus, etc. (Normally, the evacuations—from two to four in the twenty-four hours—are of the consistency of thick porridge, perfectly smooth (without lumps), and brightly yellow in color, often assuming a greenish tinge on exposure to the air.)

4. If there is *continuous and satisfactory gain in weight.*

Progressive increase in weight is the most reliable index of good nutrition. Up to the age of three months the infant should gain 6 ounces a week—an average of about ⅞ ounce a day; above this age, about 4 ounces a week to the end of the year. An average gain of less than ⅔ ounce a day, in early infancy, usually indicates poor nutrition, or illness present, or impending. The average weight of the normal infant for each month after the third is approximately equal to the age in months plus ten.

Failure to make satisfactory gain in weight, in the absence of other causes, indicates that the

food is insufficient or unsuitable, or that it is not digested and absorbed.

Common symptoms of indigestion are: persistent regurgitation—"spitting up"—of the food; vomiting; colic; "wind on the stomach"; diarrhœa; an unnatural appearance of the discharges from the bowels, or the presence of "curds" (lumps of whitish material) or mucus therein.

Fat-indigestion is indicated by the vomiting of sour-smelling curds an hour or two after a feeding; by diarrhœa, with greenish yellow stools, and by the presence of whitish masses, or lumps, in the stools; by constipation, with large, hard, light-colored (grayish) stools.

Sugar-indigestion is characterized by "wind" on the stomach and bowels; "wind colic," relieved by the belching of wind and passing it by the rectum; acid discharges from the bowels.

Protein-indigestion by vomiting of "cheesy" material; bad-smelling stools containing "curds" and mucus. The infant fails to gain in weight and strength, and is usually hungry.

Indigestion may be due, also, to an excess in the quantity of food given; to over-frequent feeding; to some disorder or disease affecting the digestive system; and it may be due to unsuitable milk, or to milk that has not been cared for properly—"unclean" milk.

The different varieties of indigestion are not always sharply defined by the symptoms; but in any case, a change in the composition of the food is indicated. Both the fat and the sugar may be reduced—and very largely reduced, if need be—for a time, without risk of seriously impairing nutrition. (Continued deficiency of fat, however, exposes the child to rickets.) But if the trouble comes from the proteins, the reduction may not be carried beyond certain limits without grave risks. These limits are different for different individuals, and under different conditions; so far as any general statement can be made, it may be said that in the case of young infants—from one to three months old—the percentage of proteins should not be carried below 1.25 for any length of time, or below 1.50 for older infants. If, after due reduction of the proteins has been made, protein-indigestion continues; or if the infant, upon the reduced quantity, fails to make satisfactory gain in weight and strength, "whey-cream" mixtures may be substituted for mixtures of cream and milk, or the cream and milk may be predigested. If "whey-cream" mixtures are employed, the sum of the casein and whey-proteins in each case should be equal to the percentage of proteins required by the infant

in health. The "whey-cream" mixtures are particularly useful in the management of very young infants.

In difficult protein-digestion, barley water should be employed instead of plain water as a diluent; the quantity of lime water may be increased with advantage, also.

Predigestion may be accomplished satisfactorily by the use of Fairchild's Peptogenic Powder. This powder, with full directions for its use, may be obtained at most drug stores.

The cream and milk should be digested before lime water is added; otherwise the mixture will be colored brown. This discoloration, however, does not appear to affect the food values in the least. Peptogenic powder is largely composed of milk-sugar; the amount of sugar added to the mixtures should be reduced accordingly. In spite of theoretical objections to predigestion, food thus prepared may be employed, for considerable periods at any rate, without any apparent ill effect. But predigestion, which affects only the casein in the cream and milk, should seldom be necessary.

In certain intestinal diseases the fat-digesting power is very much diminished; in these cases, and in some cases of diarrhœa, fat may

be practically eliminated from the food temporarily with the best results; at the same time the proteins may often be increased with benefit. These indications are met by the use of skim milk, or "fat-free" milk, which may or may not be diluted with water or barley water.

In cases of intestinal indigestion, mixtures containing a relatively large quantity of proteins with a small quantity of fat are indicated; these mixtures can be obtained only by the use of skim milk, or "fat-free" milk, in the preparation of the food. They are seldom required for the infant in health, and generally should not be employed except by the direction of the physician. But in appropriate cases they are exceedingly useful.

For the preparation of these mixtures, the skim milk that is left after the removal of 6 ounces of cream from a quart bottle of milk may be employed usually. This skim milk (mixed) contains about 1.25 per cent of fat; the lowest 8 ounces contains somewhat less fat than this, but even so-called "fat-free" milk, obtained by separating the cream with the centrifuge, contains about 0.50 per cent of fat. "Fat-free" milk is supplied by most large dairies. In certain conditions, it may be used instead of skim milk for preparing the mixtures. (Table IV.)

TABLE II — The Feeding of the Normal Infant in Health

Mixtures, No.	I.	II.	III.	IV.	V.		VI.	VII.	VIII.	IX.	X.	XI.
Age	1st wk.	1–2 wks.	2–4 wks.	4–6 wks.	6–8 wks.		2–4 mos.	4–6 mos.	6–8 mos.	8–10 mos.	10–11 mos.	11–12 mos.
Materials	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Cream	1 1/3	2 2/4	3 1/4	4	3 2/4	5	5 7/8	5 1/8	5	4	2 1/3	Plain milk
Milk	2	4	4 2/4	5	6	8	8 1/2	11 1/2	16	26	39 1/3	
Milk-sugar	2/4	1 1/8	1 1/4	1 2/8	1 2/8	1 5/8	1 1/2	1 2/8	1 2/8	1 1/4	1/3	
Lime water	1	1 1/4	1 1/4	1 1/4	1 1/4	1 5/8	1 5/8	1 5/8	1 2/4	2	2 1/3	
Water or barley water, etc.	11 1/2	16	14 2/4	13 2/4	13	17 6/8	16	13 2/4	13 1/4	10	3 7/8	
Quantity of food	16	24	24	24	24	32	32	32	36	42	48	48
Quantity of food at each feeding	1 1/3	2	2 1/4	2 1/2–3	3–3 1/2		3 1/2–4 1/2	4 1/4–5	5–6	6 1/2–7	7–8 1/2	8 1/2–9 1/2
Day feedings, 6 A.M. to 10 P.M.	9	9	8	7	7		7	7–6	6	6–5	6–5	5
Night feedings	1–2	1–2	1	1	1		0	0	0	0	0	0
No. of hours between feedings	1 1/2–2	2	2	2 1/2	2 1/2		2 1/2	2 1/2–3	3	3	3–4	4
Formulas	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
fat	2.00	2.50	3.00	3.50	3.50		4.00	4.00	4.00	4.00	4.00	4.00
proteins	0.75	0.95	1.12	1.25	1.35		1.50	1.75	2.00	2.50	3.00	3.50
sugar	5.00	6.00	6.50	7.00	7.00		7.00	7.00	6.50	6.00	5.00	4.50

The quantity of fat in each mixture may be decreased, or increased, by changing the proportions of the cream and milk employed; in mixtures of 24 ounces each ounce exchanged decreases, or increases, the fat by 0.50 per cent; in mixtures of from 32 to 42 ounces, by 0.35 per cent (about).

TABLE III — "WHEY–CREAM" MIXTURES

(In Cases of Weak Protein Digestion)

Mixtures, No.	I.*	II.*	III.*	IV.	V.	VI.	VII.	VIII.
Materials	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Cream	$\frac{7}{8}$	$\frac{7}{8}$	$2\frac{1}{4}$	3	$3\frac{3}{4}$	$4\frac{1}{2}$	$5\frac{1}{4}$	$4\frac{3}{4}$
Milk	$\frac{1}{2}$	$\frac{1}{2}$	0	0	0	0	0	$1\frac{3}{4}$
Whey (from skim milk)	4†	8†	$16\frac{1}{2}$†	21	$20\frac{1}{2}$	$19\frac{1}{2}$	$18\frac{3}{4}$	$17\frac{1}{2}$
Milk-sugar	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{0}$	$\frac{1}{2}$	$\frac{1}{2}$
Water, barley water, etc.	$10\frac{5}{8}$	$6\frac{5}{8}$	$5\frac{1}{4}$	0	0	0	0	0
Quantity of food	16	16	24	24	24	24	24	24
Formulas: fat	Per cent. 1.00	Per cent. 1.00	Per cent. 1.50	Per cent. 2.00	Per cent. 2.50	Per cent. 3.00	Per cent. 3.50	Per cent. 3.50
Formulas: casein	0.25	0.25	0.25	0.33	0.40	0.50	0.60	0.75
Formulas: whey-proteins	0.30	0.55	0.75	0.90	0.80	0.90	0.90	0.90
Formulas: sugar	3.00	4.00	5.00	6.00	6.00	6.50	7.00	7.00

*Nos. I, II, and III are suitable for the premature infant.

† No. I. By substituting "2 per cent whey" the fat is increased from 1 to 1.50 per cent. No. II. By substituting "2 per cent whey" the fat is increased from 1 to 2 per cent. No. III. By substituting "2 per cent whey" the fat is increased from 1.50 to 3 per cent (nearly).

Cows' milk in the text refers to the mixed milk of a herd of cows. "One cow's milk" should not be employed continuously as a substitute food; fluctuations in the health of the individual animal make it much less uniform in character, and at times it is utterly unfit for use.

TABLE IV — For Infants Whose Fat-Digestion Is Weak

Mixtures, No.	I	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
Materials	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Cream	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	1	$1\frac{3}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$
Skim milk	$6\frac{3}{8}$	$8\frac{1}{4}$	$7\frac{7}{8}$	$9\frac{3}{4}$	9	$8\frac{3}{4}$	13	$12\frac{1}{4}$	16	$15\frac{1}{4}$	$19\frac{1}{4}$	$18\frac{1}{2}$
Lime water	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$
Milk-sugar	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	1	1	1	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$
Barley water, etc.	$15\frac{3}{4}$	14	14	$13\frac{1}{4}$	$12\frac{1}{2}$	$12\frac{1}{2}$	$9\frac{1}{4}$	$9\frac{1}{4}$	$5\frac{3}{4}$	$5\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$
Quantity of food	24	24	24	24	24	24	24	24	24	24	24	24
Formulas	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
fat	0.75	0.75	1.00	1.00	1.25	1.50	1.00	1.50	1.50	2.00	1.50	2.00
proteins	1.00	1.25	1.25	1.50	1.50	1.50	2.00	2.00	2.50	2.50	3.00	3.00
sugar	6.00	6.50	6.50	7.00	7.00	7.00	7.00	7.00	7.00	7.00	6.50	6.00

To obtain mixtures of 32 ounces multiply each quantity by $1\frac{1}{3}$.

Notes. — Other mixtures containing relatively small quantities of fat may be prepared from Table II.

If less fat is desired in any one of the tabulated mixtures substitute "fat-free" milk for the skim milk.

In certain conditions, particularly in cases of intestinal disorder or disease, skim milk or "fat-free" milk diluted with from one to three parts of water, usually, may be employed for a time. Generally these mixtures (Table IV) should be used only by and under the direction of the physician.

CHAPTER VII

Substitute-Feeding Continued — Infant Foods — General Directions — The Wet Nurse — Mixed Feeding — Weaning

IT remains to consider artificial foods other than cows' milk that are very largely used, mainly by authority of the manufacturer.

In our study of foods, we learned that the essential proteins can be obtained only from animal tissues; from certain families of plants —of which two of the most important are represented, respectively, by wheat and by beans; from eggs and from *milk;* fat from the fat of animals, from vegetable oils and from *milk;* carbohydrates (starch and sugar) from vegetables and fruits, and from *milk.*

But the infant cannot eat the flesh of animals, while vegetable proteins are quite as unsuitable in form, and comparatively hard to digest. Moreover, the vegetables that furnish proteins are rich in starch also, and young infants cannot digest starch. And in our study of digestion, we learned that fat taken as food must be emulsified before it can be absorbed, and that this part of the digestive process is accomplished

by the action of the pancreatic juice; but the pancreas is not fully developed, and the pancreatic juice has but little if any emulsifying power before the age of ten or twelve months.

Of all food substances, milk is the only one in which the fat is in the form of an emulsion, the only one that bears the slightest resemblance to the infant's natural food; and cows' milk contains precisely the same nutritive elements as breast-milk, and is similar in composition. There is certainly no reason why we should expect to find, among wholly dissimilar products, a more suitable substitute food, and with our present knowledge of the modification of cows' milk there is no occasion to seek it among them.

There are, however, many "Infant Foods" in the market. Some of them are prepared from cows' milk by taking out the water, evaporating it, and in this case we must restore the food to its original form, convert it into fluid milk of poor quality, by the addition of water. If the food is prepared from other materials, fresh cows' milk must be added in order to give it the necessary food values. Some of these preparations are miscalled; that is, they are not *foods* within the meaning of the term as applied to them, since their nutritive value depends mainly

upon the cows' milk that is added; and as "modifiers" of milk they have no advantage over other and much less expensive agents, while there is the disadvantage that their exact composition is not known.

All the patent foods contain a large amount of milk-sugar, or its equivalent carbohydrate; in many of them, indeed, it is practically the only nutritive element. Accordingly, if they are employed for purposes of modification, milk-sugar (or cane-sugar) should be omitted.

While each of these foods is composed of several different materials in combination, all of them, substantially, are included in the three general divisions or classes:

1. Farinaceous Foods.
2. The "Liebig" Foods.
3. Milk Foods.

1. Farinaceous foods are prepared from cereals—wheat, oats, barley, etc. They all contain starch, and are unsuitable for young infants on this account.

2. The "Liebig" foods, also, are prepared from cereals; but in this case the starch is converted into a more soluble substance called dextrine; that is, it is practically partially digested. Many of them contain malt-sugar (maltose) also. Both dextrine and maltose are carbohydrates,

having the same nutritive office as milk-sugar. But as breast-milk contains milk-sugar, it is hardly reasonable to suppose that other carbohydrates serve the purpose better.

The "Liebig" foods are prepared for use by the addition of cows' milk.

3. Milk Foods.

These foods are prepared from cows' milk by evaporating the water, and adding milk-sugar or other carbohydrates (maltose, etc.) to the residue. The evaporation is effected by the application of heat. The milk foods necessarily lack the essential element of milk—freshness; moreover, when prepared for use by the addition of water they contain relatively too much carbohydrate (sugar, or its equivalent), and are deficient both in fat and in proteins.

The same objections apply to condensed milk, or "evaporated cream," which is prepared from cows' milk in essentially the same way as the dry milk foods; but in this case only about 75 per cent of the water of the milk is removed (evaporated). The canned article contains a very large amount of sugar, which is added as a preservative so that the milk will keep for some time after the can has been opened.

Condensed milk is sterilized milk, of course;

and would be unsuitable for continuous use on this account alone.

Infants who have been fed upon canned condensed milk may be fat from the very large relative quantity of sugar (or maltose, etc.) in their food; but the fat baby is not necessarily healthy, or well-nourished, and may be very poorly nourished.

That one infant, or two, or ten, lives, even if vigorous and apparently well developed, upon food that we know is inferior, or improper, or imperfect, gives no warrant for the use of such food when better may be had and is, indeed, at hand. For if the few do well in spite of it, the many do very ill because of it. Moreover, imperfect nutrition and development are not always disclosed at once.

It should not be understood, however, that patent foods are of no value and can be of no service; but it should be understood that they are much less nutritious than cows' milk, to which they are inferior in all respects for feeding the normal infant in health. As modifiers of milk, they add no elements that are lacking in cows' milk and are found in breast-milk, but they add instead elements that nature omitted from both.

Among those who have given most study

to the subject, and whose experience in the use of artificial food has been largest, there is but one opinion: that fresh cows' milk, properly modified, is not only the best, but the only fit substitute food for continuous use. And all scientific records show that infants who are deprived of fresh milk for any length of time are thereby directly exposed to the evils of malnutrition, to imperfect development, to disease in general, through diminished powers of resistance, and to certain diseases in particular, especially to scurvy and rickets.

GENERAL DIRECTIONS FOR FEEDING

These remarks apply to the management of the nursling, also.

Ordinarily, regular feedings should not be begun before the third day, when usually the mother's breasts "fill." If food is required in the meantime, a few teaspoonfuls of a solution of milk-sugar (a level teaspoonful of milk-sugar to 2 or 3 ounces of water), or of fresh cows' milk diluted with three parts of water, and sweetened, may be given three or four times in twenty-four hours. The first feedings, however, are directed by the physician in attendance, generally. If food is given at this time, a rag nipple rather than a spoon should be used as the means.

The position of the infant at the breast, or when taking food from the bottle, should be made convenient and comfortable, with head and shoulders slightly raised above the level of the rest of the body. In the case of the nursling, care should be taken always that the distended breast does not shut air from the nostrils.

Artificial food should be lukewarm (at a temperature of 100°) when given, since stomach digestion cannot go on at a temperature below that of the blood.

The directions given in the tables as to the quantity of food to be given at each feeding are based upon the average stomach-capacity of the infant at different ages. The importance of avoiding distention of the stomach, in the case of the bottle baby particularly, has been explained; unless these quantities are clearly insufficient, therefore, they should not be exceeded, in early infancy especially. Regurgitation—the rejection of a portion of the food very soon after the feeding—unless caused by "bottle-wind," by the pressure of the liver, which in early infancy is very large, or by other mechanical cause, usually indicates distention of the stomach. The bottle baby almost always swallows air with the food, and when

this "bottle-wind" is expelled, some of the food is likely to be expelled with it. This accident may be avoided by raising the child to a sitting posture immediately after the feeding; in this position, the wind usually comes up by itself without any loss of food. The "wind" having been gotten rid of, the young infant should be placed on its right side always, that the weight of the liver, which occupies a good part of the abdominal cavity on the right side, may not press upon the well-filled stomach, either to cause regurgitation, or to interfere with the muscular movements that so greatly assist stomach digestion. Unless due to some of these causes, persistent regurgitation means either that the food is not suitable or that the digestion is at fault. (The milk thus rejected is necessarily "sour" and "curdled" because the gastric juice is acid, and casein always forms curds in the stomach.)

Generally, the nursling will not overload the stomach if not allowed to have the breast longer than from twenty to twenty-five minutes at a time; but in the case of the nursling distention does not matter so much, and it is always better that the excess of food should be rejected.

As far as may be, the infant should be fed

at regular intervals, which ordinarily should not be more frequent than the table prescribes.

The stomach digestion occupies between one and two hours; when completed, the food passes into the intestines; if, before the stomach is emptied, a fresh supply of food is added to its contents, some of the proteins must escape undigested. Infants fed too frequently often have voracious appetites, not because insufficient food is taken, but because so much of it, especially so much of the proteins, goes to waste. To increase the quantity, or the strength, of the food in these cases is a serious error.

Generally, the infant wakes early, and the day feedings may be begun at about 6 A.M. From this time until about 10 P.M. food should be given at intervals of not less than two and a half to three hours, except for the first three or four weeks, when the intervals may be shortened to two hours.

The all too common practice of offering the breast, or the bottle, whenever the child frets is altogether bad. Fretfulness is very often due to slight indigestion, and over-frequent feeding only adds to the trouble.

Habits, good and bad, are easily acquired, even very early in life. Among good habits, none is more desirable in infancy than that of sleeping

at night. To this end, the afternoon nap, which should be taken early always, may be denied, and even the morning nap shortened, if need be, until the right habit has been formed. Night feeding, particularly night nursing, should be limited to the absolute need for food. The quality of the breast-milk is very likely to be impaired if the mother fails to get sufficient sleep.

After the last day feeding, at about 10 P.M., infants above the age of two or three months should sleep continuously for seven or eight hours. If the child wakes in the night, a draught of water and change of position—perhaps a fresh diaper, also—will usually induce it to go to sleep again, once the night-feeding habit has been broken off.

The young infant needs water quite as much as it needs food, and probably cries oftener from thirst than from hunger. A draught of water will often quiet the little one when the administration of food would be injudicious. As early as practicable the water should be given directly from a cup rather than from a spoon; weaning is less troublesome if the child has already been taught to drink from a cup.

The weight is the only absolutely reliable index of the nutrition. In doubtful cases, at

any rate, it should be tested and recorded daily, or every second day, care being taken that the conditions as to time of day, clothing, etc., are the same always. As already stated, the average normal gain is 6 ounces a week for the first three months, and about 4 ounces a week after that. Loss of weight during the first three or four days of life is physiological; but this initial loss, which may be as much as 9 or 10 ounces, should have been made up by the end of ten days or two weeks; from this time the gain should be continuous.

Without a record of the weight, it is often impossible to determine whether or not the child is properly nourished. This applies to the nursling, also.

If more food is prepared than the child takes in the twenty-four hours, the excess must be thrown away, of course; this, however, should seldom be more than a few ounces, and as modified milk is always diluted milk, the actual waste is small.

The nursing bottle that may be thoroughly cleansed most certainly and most easily is the best, and that is a bottle with sloping shoulders and round bottom. It is well to have as many nursing bottles as the child requires feedings in the twenty-four hours. The greatest care

must be taken to keep them perfectly clean. After thorough washing with the aid of a bottle washer, they should be rinsed in boiling water, or in very hot water. Cases of lead poisoning have been recorded from the use of shot to remove the dried milk from the inside of the bottles. Milk left in the bottle after a feeding should be thrown away.

Nipples should be made of pure rubber and frequently renewed. Only those that slip over the neck of the bottle should be employed. They should have several small openings distributed around the circumference rather than a single larger central one, which is apt to cause choking.

Nipples to which a rubber tube is attached for conveying the milk from the bottle ought never to be used; it is impossible to keep the tube clean. Immediately after a feeding, the nipple must be removed from the bottle, turned inside out, and thoroughly washed. A little salt will assist the cleansing of the rubber when it becomes "coated." When not in use, it should be kept alternately in salt and water and in a solution of cooking soda, a teaspoonful to a cup of water. Not more than twenty-five minutes should be allowed for a feeding; at the end of that time, or as soon as the child has finished

its meal, the bottle should be taken away, at once rinsed, and kept filled with water until it can be washed thoroughly with soap and brush.

THE WET NURSE

With the advance in knowledge of infant feeding, the wet nurse has fallen into disfavor. Exceptionally, the services of a wet nurse may be of the greatest value; but generally they should be employed only after all other methods of feeding have failed. It has been well said that "a mother who denies her own child in order to suckle the child of a stranger for hire is not likely to be well developed morally, intellectually, or physically."

MIXED FEEDING

When the breast-milk is merely insufficient in quantity, being normal in other respects, lactation should be maintained, and the deficiency made up by artificial food. Better results follow this so-called mixed feeding, as a rule, than are obtained by artificial feeding alone. And the younger the infant the greater the risk of depriving it altogether of its natural food, of which even a very scanty supply may be of the greatest service. The later the use of other food is begun the better, since the ability to

digest and assimilate it increases with age and development. If practicable, the breast-milk should be analyzed as a guide to the mixtures to be employed for the supplementary feeding; if the mother's milk is suitable, a modified milk containing the same percentages of fat, proteins, and sugar may be prepared; if unsuitable in any respect, the particular fault may be corrected in the preparation of the artificial food.

WEANING

Efforts to wean the child, whether from the breast or the bottle, should not be made ordinarily until it has reached the age of ten months; or, in the former case particularly, delayed beyond the end of a year, for the reason that the mother's milk, even if abundant, is likely to be changed in character by prolonged lactation, and is often unfit for the infant.

In general, it may be said that the appearance of all the incisor teeth—four in each jaw—indicates that the digestive organs are so far developed that the use of other foods, in addition to milk, are permissible; and, it may be, desirable. The infant is now able to digest starch, and a small quantity of food containing starch may be given, often with advantage. Barley and oat jellies are suitable preparations

of the cereals. Milk, however, should be the main dependence; indeed, the use of other foods is not necessary before the end of the year, and by that time the infant should have been weaned, ordinarily. But weaning should not be attempted when the child is not well; or when teeth are coming through; or in very hot weather, and it should be made gradually. "Gradually" does not mean that weeks should be occupied in making the exchange of the breast, or the bottle, for the cup and spoon; and once undertaken, the effort should not be abandoned, or suspended, without sufficient cause.

The following plan is a very good one: assuming that the child has been taught to drink from a cup, one of the regular feedings is given therefrom for a day or two; then two, and so on until the breast, or the bottle, has been withdrawn, except for the last feeding at ten o'clock. The first time this sole remaining solace of the nipple is denied, the substitute will be declined vigorously, and the child will cry itself to sleep—and must be allowed to do so. Generally, no compromise can be effected the second night; but the refusal will be less vociferous and sleep will come sooner. Meanwhile, the cup has been gaining in favor. By the third

night it will have occurred to the little philosopher that milk from a cup at any time may be very much better than none, and a full stomach, however filled, more comfortable than an empty one "to go to sleep on"; the experiment will be consented to and the ordeal will be over.

CHAPTER VIII

The Second Year

THERE need be no apprehension that the child will suffer in any respect if it has nothing but milk until well into the second year, though the limited use of other foods may be begun at the age of ten months. Only the simplest food substances should be added at first, change to the diet of the adult being made very slowly. The beginning is to be made usually by the use of some of the farinaceous foods in combination with milk. Among eligible preparations are barley and oat jelly and a pap made of stale bread crumbs (boiled in water enough to cover them and added to the milk). An excellent food for infants with weak digestion may be prepared by boiling wheat flour tied up in a linen bag for several days, or until it has been converted into a chalk-like mass, from which a sufficient quantity may be grated and mixed with the milk.

Barley and oat jelly are made as follows: Soak 4 ounces of granulated barley, or of coarse oatmeal, in a quart of cold water for twelve hours; boil down to a pint, and while hot strain

through a fine cloth. On cooling, a jelly is formed, of which any desired quantity, salted to taste, may be added to the milk. Equal parts of cereal jelly and milk may be employed in the beginning. The oat jelly contains more starch than the barley jelly, and a considerable percentage of fat also; it is one of the most nutritious of the cereals. Until the infant is a year old the diet should be restricted to milk, with the addition of the simple foods that have been mentioned. But with the beginning of the second year the dietary may be enlarged somewhat, though milk should be the main dependence throughout the period of infancy.

It may be remarked again that since teething is a physiological process, it is never the direct cause of illness or disease. The disorders so often attributed to the eruption of the teeth are always dependent upon other causes, and must be regarded accordingly.

During the second year, as during the first, the same food elements—proteins, fat, carbohydrates, and minerals—of course, must be furnished in due proportions. For the supply of proteins, milk, the white of egg, chicken and mutton broths, and wheat flour (which contains the vegetable protein, gluten) must be relied upon mainly. The nutritive principles of

meats are not soluble either in hot or in cold water; beef tea, therefore, and broths from which the fat has been removed, as it should be always for the use of the infant, contain little or no nourishment, but only the principles that give to each kind of meat its peculiar flavor; they are of little value save as vehicles for other food substances (bread, rice, etc.), and for their stimulating effect upon the digestive organs.

But the child is now able to digest starch, and the cereals become an important part of the dietary: stale bread, at least a day old; baked white potatoes, which may be mixed with milk; boiled rice, and the wheat foods generally. Rice cones, made by boiling half a cup of rice in a pint of milk until all the milk has been absorbed, salted, and put aside in small cups to cool, may be served with simple custard, at the age of sixteen or eighteen months.

At this age, butter may be added to the bill of fare—the cereals being served with butter and sugar as well as in milk. Ripe fruits, except bananas, which are comparatively indigestible, are permissible during the second year; though most of them are better cooked. Sliced apples, currants, plums, apricots or other fruit, put into a jar, well sprinkled with sugar and thoroughly baked, are suitable fruit prepara-

tions. Baked apples with milk, or cream, and stewed prunes are eligible also—both are particularly useful in cases of constipation.

In the beginning of the second year, five meals a day are required ordinarily, of which the last should be given late in the afternoon. Milk must still be the main reliance, though other simple foods may be added, as in the following illustrative menu:

Meal No. 1. Bread and milk, warmed.

No. 2. Oat jelly and milk, equal parts, salted.

No. 3. Mutton or chicken broth, with bread crumbs. (All fat should be removed.)

Nos. 4 and 5. Bread, or oat jelly, and milk.

Throughout the period of infancy the following articles should be forbidden: cake of all kinds, pastry and candy; all fried foods; condiments, except salt; pickles, preserves, etc., and vegetables, except potatoes. Generally, solid food should not be given until the completion of dentition indicates that the powers of digestion and assimilation are sufficiently developed. But the simplest foods are best always, and the diet of infants and children, particularly, should be restricted accordingly.

Regularity in the meals is most important. Young children who are allowed to eat every-

thing, at all times, thrive, if at all, in spite of their indulgences.

Indeed, the health of the infant during the second year as during the first depends mainly upon intelligent and careful feeding. Let it be remembered that there is far more danger of over-feeding than of under-feeding at this period. When in doubt as to the propriety of allowing a particular article of food, give the little one the benefit of the doubt by withholding it.

The child should be undressed and put to bed at the same early hour every night—care being taken that the sleeping room has been well aired and well sunned. Draw the shades or the blinds that it may not wake with the sun.

The midday nap should be taken every day.

The more time the child spends out-of-doors the better.

The "all wool" abdominal band should be worn at all times—it is even more important in summer than in winter—to prevent sudden chilling of the surface, and consequent intestinal disorders.

Mental activity at this period should be discouraged. The infant should be guarded carefully against excitement, particularly against mental shock, from surprise of whatever na-

ture, as, for instance, a sudden unexpected movement or noise.

If the child is properly cared for, there need be no fear of the dreaded "second summer," which has far less dangers than the first, for with every day of life it becomes stronger and better fitted to survive. That the second summer demands fewer victims than the first is a matter of record. It is time this grim old ghost were laid.

The Hygiene of Infancy is discussed in Chapter X.

CHAPTER IX

The Premature Infant

NORMALLY, gestation occupies two hundred and eighty days; children born at the end of this period are said to be born "at term"; those born earlier are premature. Other things being equal, the nearer the birth is to term, the greater the chances are that the infant will survive; the child born at the end of eight months, therefore, is more likely to live than one born at the end of seven months. While, of course, effort to preserve life is to be made in every case, there is little probability of success if birth takes place before the end of six and a half lunar months (182 days).

Every case of premature birth demands the most constant and watchful care. There is, however, much encouragement in the teaching of experience—that if life can be prolonged until the time when gestation would have been complete, and if, meanwhile, *the weight of the child increases,* the chances of its existence are almost, if not quite as good as those of the infant born at term.

The successful management of the prema-

ture infant depends mainly upon three things: warmth, rest, suitable food and feeding.

The infant born before the end of the eighth month must be placed as speedily as possible and allowed to remain in an atmosphere that has been heated to a temperature of 90°—a degree of heat that must be maintained with the least possible variation. To meet this requirement particularly, special contrivances known as incubators have been devised, and are well-nigh indispensable to the proper management of these cases. They are kept for rental in all large cities, generally by dealers in surgical supplies.

If an incubator cannot be obtained at once, a basket may be made to serve the purpose temporarily. An ordinary clothes basket is well lined with flannel, and, save for a small space left open for the entrance of air, covered with a blanket. A number of bottles, sufficient to raise the temperature to 90° when partially filled with hot water, are placed inside. These bottles are only partly filled, so that either hot or cold water may be added according to the indications; generally, the temperature in the basket should be between 85° and 90°. A thermometer is absolutely necessary, of course.

The infant born before the end of the eighth month should neither be washed nor dressed—

even the diaper should be dispensed with—but should be wrapped at once in well-warmed cotton batting, and put into the receptacle prepared for it. (The child may be kept clean by placing a quantity of absorbent cotton beneath the buttocks to soak up the discharges. This should be changed twice a day. The absorbent cotton should be in the form of a sheet, not a "wad," and perfectly smooth.) These infants should be kept as nearly absolutely quiet as possible, in a darkened room. They should not be handled or moved unnecessarily.

For the first twenty-four hours little or no food is required; warmth, and sleep, and rest are the essential things. But from the second day, food should be given hourly, day and night.

Eight months' infants, if vigorous, may be put to the breast—after the milk comes in, not before—but generally, breast-feeding is impracticable; moreover, the mother's milk is often found to be unsuitable in cases of premature birth.

Seven months' babies are not strong enough to draw milk from the breast, or to bear the handling and exposures which nursing involves. In these cases, the milk, if suitable, must be pumped out and fed from the dropper or the bottle. A large-sized medicine dropper,

so shaped that a nipple may be fitted over the distal end, is a convenient device for administering food.

The quantity of food required must be determined by the conditions in each case, bearing in mind the very limited capacity of the stomach. At the age of seven months, not more than a teaspoonful, and at eight months, not more than two or three teaspoonfuls of food should be given at a time, in the beginning. These quantities are to be increased gradually up to from 1 to 1½ ounces—eight to twelve teaspoonfuls—at each feeding, at the end of four or five weeks. At seven months, food should be given hourly; at eight months, every hour and a half, day and night. In the feeding of the premature infant, "whey-cream" mixtures are often useful (Table III). Appropriate mixtures of cream and milk are shown in Table V.

The food may be regarded as suitable in character and in quantity if it is not rejected by the stomach, if it satisfies hunger, and if the weight increases from week to week. Frequent loss of weight for a day or two is common, but these losses in favorable cases are promptly made up.

Hunger is indicated by a continuous whimpering.

The weight should be taken every second day. If a suitable contrivance for this purpose is not furnished with the incubator, the infant should be weighed in a shallow pan, properly upholstered, into which it should be lifted with the greatest possible gentleness.

TABLE V

THE PREMATURE INFANT.—MIXTURES OF CREAM AND MILK

Mixtures, No.	I.	II.	III.
Materials	Oz.	Oz.	Oz.
Cream	½	1¼	1¾
Milk	2	3	5
Lime water	¾	1½	1½
Milk-sugar	⅜	¾	⅞
Water, etc.	12¾	18¼	16
Quantity of food	16	24	24
Formulas: fat	Per cent. 1.00	Per cent. 1.50	Per cent. 2.00
Formulas: proteins	0.50	0.75	1.00
Formulas: sugar	3.00	4.00	5.00

For suitable "whey-cream" mixtures see Table III.

CHAPTER X

Sleep — Clothing — Exercise — Bathing — Teething — General Considerations

THE new-born baby should sleep eighteen out of the twenty-four hours; indeed, for the first two or three days of life, sleep is by far the most important consideration. It should not be interrupted on any account. As age increases, less sleep is required; but until the age of two and a half years, when childhood begins, from sixteen to thirteen hours out of every twenty-four should be spent in sleep. During their waking hours, vigorous infants are in well-nigh perpetual motion. Doubtless their brains, also, are active, there are so many things to be investigated—so that by the end of the day's work, they must be pretty well tired out. By six o'clock, therefore, the infant should be undressed and put to bed; otherwise, it will fall asleep a little later from sheer inability to keep awake, and under conditions that make refreshing sleep and complete rest impossible.

Undressing the sleeping infant or child interrupts its sleep and causes more or less disturbance of the nervous system. All this may

be avoided by having a regular bed hour, which should not be later than six o'clock; in a short time, a habit of going to sleep at this hour will be formed. Generally, the last day feeding should be given at from ten to half-past ten o'clock in the evening. For the first two or three weeks, two night feedings (between 10 P.M. and 6 A.M.) may be necessary; after a month, but one need be given; and at the age of about three months, night feeding may be dispensed with altogether. Thereafter, the infant should sleep continuously from 10 P.M. until 5 o'clock in the morning, as it will, generally, after the accustomed feeding has been withheld for two or three nights in succession. If the little one wakes during the night, a drink of water and change of position will induce it to go to sleep again. A soiled diaper or other cause for discomfort must be removed, of course.

The habit of taking a midday nap should be established very early. To this end, the infant should be undressed and put to bed every day between eleven o'clock and noon, and, preferably, soon after a feeding. If this practice is begun at the age of four or five weeks the child will usually go to sleep promptly—as long as the daily nap is necessary—if made perfectly comfortable, and left to itself in a darkened room.

All babies are not equally docile, of course, and in some cases the mother, or the nurse, must sit by the crib until sleep closes unwilling eyelids; so much may be conceded. But the mother who would be relieved of a very great burden in the end must deny herself the happiness of rocking her little one to sleep in the beginning.

The healthy child should be allowed to sleep until it wakes naturally, unless there is a disposition "to turn night into day." In this case the nap should be taken a little earlier in the forenoon, and should not be prolonged beyond the noon hour. If necessary to awaken the infant at any time, it should be done as gently as possible, and gradually; sudden rousing, with its inevitable shock to the nerves, may have very serious consequences.

The youngest infants should have two naps during the day—the first and longer one between nine and ten o'clock in the forenoon, the second not later than four in the afternoon. Older infants differ as adults do in their requirement for sleep; in some cases, the midday nap seems to be unnecessary after the age of eighteen or twenty months.

The important thing is uninterrupted sleep at night; sleep at night is not only more refreshing, but it contributes very much to the comfort

and the welfare of the mother, and is the ultimate end to be achieved.

In the case of ill-nourished and weakly infants, prolonged sleep may mean the accumulation of blood in the brain—"passive congestion" it is called—which may be the exciting cause of inflammation. This condition is due to sluggish circulation of the blood, which the heart lacks the power to keep properly in motion. In these cases, the position of the sleeping infant should be changed at intervals; it should be taught to lie upon the side rather than upon the back, and should be turned from one side to the other occasionally.

Sedatives, in the form of "soothing syrup," never should be given. In cases of wakefulness or restlessness of which the cause is not known, a warm or hot bath meets the requirements much better than drugs, and cannot do harm. Infants are peculiarly susceptible to opium in any form; even a small dose may be fatal. Moreover, the causes of sleeplessness and fretfulness cannot be removed by remedies of the kind, which mask the real disorder, and may create others far worse.

An early bed hour throughout the periods of infancy and childhood is an essential condition of normal development—particularly, normal development of the nervous system.

CLOTHING

This is a matter with which fads and fashion should have nothing to do. The infant's clothing should be chosen solely with regard to adequate protection from cold, and to freedom of movement and comfort. Especial reference has been made to the sensitiveness of the infant to cold and its feeble power of resistance. It is most important that all parts of the body should be protected against cold; not only the general cold of winter, but equally against a rapid cooling of the surface, as from changes of temperature or equivalent causes. And in the clothing this should be among the first considerations.

Of the materials suitable for underwear, woolen is best because it is the poorest conductor of heat; silk comes next in this regard. Even a thin covering of woolen will prevent sudden chilling from exposures, because the heat of the body can get through it but slowly; accordingly, the abdominal band should be knitted with wool or made from flannel—and it should be worn the year round. The protection given by it lessens very much the liability to bowel troubles; next to proper food and feeding, it is the most effectual preventive of diarrhœal diseases in very hot weather. Bands of at least three degrees of

weight or thickness should be provided. If woolen irritates the skin, they may be lined with old linen. The abdominal band should extend upwards only as far as the lowest ribs, and should fit snugly enough to give support to the walls of the abdomen, without, however, interfering with their free movement. This movement is essential to abdominal breathing, by which alone the lungs are properly expanded.

With this exception, all the clothing should be loose, particularly about the neck and the chest, that the lungs may have free play, and that the passage of the blood through the great vessels that convey it to and from the brain may not be impeded; the least constriction about the chest hinders the entrance of air into the lungs, while pressure upon the veins in the neck, if sufficient to interfere with the blood current therein, may in itself give rise to the "passive congestion" of the brain that has been referred to. The fact that air is a bad conductor of heat furnishes another reason for having the underclothing loose, for the air imprisoned between it and the skin still further prevents loss of the body heat.

The head should be well covered both in winter and in summer. Its exposure to cold may give rise to various disorders, particularly

to inflammation within the ear; and direct exposure to sunlight involves danger from absorption of its chemical rays, which are more injurious than its heat rays. Chemical rays are intercepted by dark-colored fabrics—the darker shades of red are most efficient.

Especial care should be taken to keep the feet and the legs warm, since the circulation of the blood is feeblest in the extremities that are farthest from the heart. The stockings—at all seasons of the year—should be long enough to be pinned to the diaper, and the legs should be covered. When the infant is vigorous enough to kick off the bed coverings, night drawers, made of flannel for winter, should be provided.

But clothing, it may be repeated, does not create warmth; it only prevents undue loss of the heat that is generated in the body. If the garments are properly made, of suitable material—and "all-wool" fabrics are best for underwear—all its purposes may be accomplished, as they should be, without "bundling" the child up, or interference with the perfectly free movements of the body that materially assist the circulation of the blood and the distribution of the body heat. For while this constant movement of the blood depends mainly upon the muscular power of the heart, it is aided by other agen-

cies, of which muscular contraction is the most important one.

EXERCISE

Exercise is muscular contraction mainly. By assisting the passage of the blood, through the veins particularly, and by increasing the number and the force of the heart-beats, exercise promotes the nutrition of the body in all its parts; it quickens and deepens the breathing, also, so that a larger number of the air-cells of the lungs are expanded; accordingly, more air enters the lungs, and the blood is more liberally supplied with oxygen.

There is good reason, therefore, for the natural activity of the infant, which should be encouraged in every way. Even the youngest should have opportunity for the daily exercise of its muscles; to this end, it should be undressed, save for the shirt and the abdominal band, wrapped loosely in a light blanket, and left for twenty minutes every day to the performance of such gymnastics as it may be capable of. The "exercise" should be taken from one to two hours after a feeding.

As soon as the child can sit without support, it should be put on the floor, care being taken to exclude draughts, where it should spend the greater part of its indoor day.

At the age of a month, it may be taken out-of-doors in warm weather, and only in warm weather; during the fall and winter months—in temperate climates—it should be kept indoors up to the age of three or four months.

Until the infant can be supported by pillows in the sitting posture, it should not be "wheeled," but always carried in the arms, when taken out-of-doors. And it never should be laid on its back in the baby carriage, unless for an outdoor nap in midsummer; later, care should be taken that its position is changed to the side. Where the child is strong enough to sit without props, it should be taken out every pleasant day, and the more time it spends out-of-doors the better; but the outing should not be extended beyond four o'clock in winter, or beyond about five o'clock in summer. Sun light and sun warmth, provided the head and the body are properly protected from direct exposure, are peculiarly beneficial. The face should not be covered except in cold weather.

Exposure to high winds and a dust-laden atmosphere should be especially avoided. Perfectly healthy infants may develop a disease of the skin called eczema, due entirely to exposure to cold, or other atmospheric conditions by which the skin is irritated.

The child should not be encouraged to walk, or to stand, even if supported, before it is a year old.

BATHING

The reaction in the case of the healthy adult which makes the cold bath stimulating and tonic is utterly wanting in the case of the infant, upon whom its effect is altogether depressing. In early infancy sudden cooling of the surface, by which the superficial blood vessels are contracted and the blood driven into the interior, may be the exciting, or a predisposing cause of inflammatory disease, as of intestinal affections (diarrhœa) and bronchitis.

Water at any temperature—even one degree—below that of the blood, 98½°, is cold, or cool, in contact with the warmer skin, and its immediate evaporation takes more or less heat from the body (depending upon its own temperature). Indeed, the even temperature of the body in health—whatever external conditions of heat and cold may be—depends mainly upon the evaporation of the water that is constantly poured out by the sweat glands, and of which the amount is regulated automatically according to the need. In the beginning, then, the temperature of the water should be about that of the blood, or between 99° and 98°; if the

infant is vigorous, it may be reduced gradually to reach 95° at the age of six months, and 90° at the end of the first year—but it should not be carried below 90° within this period. This gradual reduction of temperature should be continued up to the end of infancy—at two and a half years—when the bath may be given at 80°. In infancy, a bath from 90° to 80°, according to age and vigor, is "cold"; from 98° to 90°, "cool"; from 99° to 100°, "warm"; from 100° to 103°, "hot."

The vigorous infant should have a "cool" bath every morning; for purposes of cleanliness, soap—of the best quality, unscented, as white castile soap—may be used daily for cleansing the hands, the head (scalp), and the buttocks, or other parts that have been directly exposed to soilure; but a full soap bath once a week is quite often enough ordinarily.

Until the infant can sit up without support, only the "sponge bath" should be given. "Sponges" for the purpose should be made up from cheese cloth, compactly folded into pads small enough to be covered by the hand; the flopping ends of a large wash-cloth convert the daily bath into a daily infliction. Sponges should not be used, as it is well-nigh impossible to keep them clean. In winter, the bath should

be given in a warm room—not below 72°—and if all the clothing is removed at once, the body and limbs should be kept covered with a blanket until the head, neck, and face have been washed and dried. Particular care should be taken from the outset to cleanse the nostrils and the nasal passages; bits of foreign material, or dried mucus, in the nose are likely to interfere with the free nasal breathing that is absolutely essential to the well-being of the infant.

The bath should not be prolonged, and the manipulation should be as rapid as may be consistent with gentleness. The body and limbs having been washed and dried, the creases and folds in the skin may be lightly sprinkled with "baby powder" to prevent chafing. Powders that contain starch are unsuitable; in the presence of moisture, this substance forms little rolls, or balls, that are likely to cause irritation.

A full sponge bath should not be given until after the remnant of the cord has separated; or, at any period, within an hour after a feeding. When the child is old enough and strong enough, it may be put into the bathtub to kick and splash for a few minutes, and only for a few minutes; but the washing should be done in the lap always.

Apart from purposes of ordinary cleanliness, the infant's bath at the usual temperatures stim-

ulates the circulation of the blood in the surface blood vessels, and rids the skin of the waste products that are left upon it by the evaporation of the water of the perspiration. The activity of the sweat glands is constant, and what is known as the "insensible perspiration" and evaporation are always going on. These waste matters, therefore, are all the time accumulating; if allowed to remain on the skin they clog the mouths of the sweat ducts, and being bad conductors of heat prevent its rapid escape from the body—and this escape, in hot weather particularly, is an important matter. These waste products are freely soluble in water, plain water; soap is not required for their removal, therefore. Moreover, soap dissolves the oily secretions of the little glands (sebaceous glands) in the skin that serve to keep it soft and flexible; for these reasons, washing with soap should be limited for the most part to exposed parts of the body —as the hands and the head and neck.

Even within the narrow limits which the feeble vitality of the young infant prescribes, the effect of a bath depends considerably upon the temperature of the water. The distinctly warm or hot bath is often exceedingly useful, not to take the place of the bath at the usual temperature, but as an additional means of pro-

moting the child's welfare and comfort. Thus, if the little one is tired and hot, or excited, or nervous, a warm or hot bath—99° to 102°—at bed hour will often bring quiet and sleep promptly. And in hot weather, particularly if there is a high degree of humidity also, it may be given several times during the day with the happiest effects. A hot bath cools the body in three different ways: (1) by expanding the superficial blood vessels so that the heat radiating surface is increased in extent; (2) by increasing the activity of the sweat glands so that more water is poured out to be evaporated; (3) by removing the waste products referred to so that heat escapes more readily and rapidly. But the warm or hot bath should not be prolonged, on account of its generally relaxing and depressing effect in this case; and immediately after it, the child should be kept quiet, or induced to lie down for half an hour.

If after the bath at the usual temperature, the infant is languid; if the lips take on a bluish tinge and the extremities are cold, tub bathing, or splashing, should be at once suspended, and sponge bathing limited to the absolute requirements of cleanliness; in these cases, only warm or tepid water should be used, and the after rubbing should be as vigorous as may be without roughness.

TEETHING

Normally, dentition begins between the sixth and the seventh months, and the first set of teeth —called the milk teeth—is complete at the age of about two and a half years. There are twenty milk teeth—ten in each jaw—which are divided and named as follows: four incisors (in front); four molars (jaw teeth); two canines (situated between the incisors and the molars). The following table shows the number of teeth of each kind in both the upper and the lower jaws. The corresponding teeth in each jaw usually make their appearance at about the same time:

Name	Incisors	Canines	Molars
Number in each jaw	4	2	4
Date of eruption (in months)	9–7–7–9	18	12–30

The opinion has prevailed among medical men, and is still generally held by the laity, that dentition, directly or indirectly, is a common cause of illness. This belief is erroneous, and mischievous in that it invites the error of attributing symptoms of serious illness to teething as a cause, to the neglect of the real trouble; even pneumonia and "inflammation of the brain" have been thus overlooked. The popu-

lar notion that diarrhœa occurring at this time is not only to be ascribed to teething, but should be regarded as rather desirable than otherwise, is a popular fallacy; this symptom is never directly due to the eruption of the teeth, and it certainly never has a favorable influence. While, therefore, dentition, which is purely a physiological process, is by no means responsible for all the evils charged against it, and is never the sole and direct cause of illness, it doubtless operates as a contributory cause, in common with other developmental changes; indeed, the activity with which during this period, these changes are going on in every part and organ of the body doubtless accounts for the susceptibility of the infant to disease. The "diarrhœa of teething," for example, may be dependent to some extent upon developmental changes in the intestines.

The routine practice of lancing the gums—based upon other venerable errors—is no longer followed, though the doctor is still summoned for the purpose. Occasionally, when the congestion and swelling of the gums are sufficient to cause pain, the knife may be used with advantage to divide the sensitive nerve-filaments involved; but an incision over the tooth hinders rather than assists its eruption, for the cut heals

very quickly, and the resulting "scar tissue" is denser and more resistant than the natural gum. The possibility of infection of the wound made by the lancet, and a consequent abscess, must not be overlooked.

A "teething ring" of India rubber or of ivory seems to afford considerable relief, and its use is unobjectionable. Attempts to "rub the tooth through" only add to the local irritation, and are worse than useless.

GENERAL CONSIDERATIONS

The nurse, or attendant, should be chosen carefully, and with discrimination; if she is to have the entire charge, even of the feeding, a trained nurse should be employed, generally. But she must be one of the many trained nurses; the few who regard the knowledge obtained in the training school as the end of wisdom, who find nothing to be learned and nothing to be unlearned—often the more important and always the harder lesson—are utterly unfit for this service. If the nurse is to be an assistant only, under the constant supervision of the mother, previous training is unnecessary, and experience undesirable; the "experienced" nurse, without training, is always largely experienced in error, and whatever the number of

her years will be found too old to learn. In any case, intelligence, aptitude, and interest are the most important qualifications.

The attendant, even if employed only to wheel the baby out, must be old enough and intelligent enough to recognize the responsibilities of her office and the importance of doing exactly as she has been told to do. She should be in good health, of an even temper, "fond of babies," and clean—of body and of mind. Always, the special caution must be given that the baby is not to be kissed upon the lips—by anybody. Very serious diseases have been communicated to infants through neglect of this caution.

When held, or carried in the arms, the infant's back should be supported; most babies have a way of throwing themselves suddenly backwards, not only at the risk of escaping from the arms and getting a bad fall, but of producing a rupture (hernia) from the strain put on the abdominal walls.

The infant should not be encouraged to stand, or to make attempts at walking, until it is a year old, at least. Some infants do not try to walk until well along in the second year; and there need be no apprehension on this account. Standing, or walking, before the feet and legs are

strong enough to support the weight of the body, is attended by risk of breaking down the arches of the feet (insteps) and of crooking the legs.

As soon as the child begins to walk, the feet should be fitted with "right" and "left" shoes, so that the arch of each foot may be supported. Doubtless, the deformity known as "flat-foot" is caused not infrequently by premature efforts to stand, or to walk, and by the ill-shaped shoes that are provided for the human foot—from infancy even to old age.

The uses of the commode may be taught very early. As soon as the child is strong enough to sit up without support it should be put onto a suitable toilet chair, every two or three hours if necessary, until its use has been learned; after that, two or three times every day, at the same hours. Generally, regular habits are speedily formed, and the infant will make known its wants at other than the usual hours by signs that may be readily interpreted. The year-old infant, if put on the chair at frequent intervals, will soon recognize and improve opportunities by which the discomforts of a wet diaper may be averted.

For obvious reasons, and particularly because of the risk of exposure to contagious diseases, travel should be eliminated as far as possible.

The street car in winter and the closed public carriage are especially to be avoided on this account.

The child's sleeping room should be the sunniest and airiest in the house. And both sunshine and fresh air should be admitted freely, the more abundantly the better. This room should not be carpeted; either a hard wood, or a smooth painted floor is much to be preferred. The less upholstery the better; not only is the air likely to be purer at all times in a plainly furnished room, but in event of illness, particularly from the contagious diseases to which children are especially liable, the little patient will do better, and the risk of harboring the contagion will be very much less. At the age of five months the baby may be vaccinated.

In every respect, the furnishings and arrangements of the nursery should be such that the little one is not constantly falling into "mischief"; things that it ought not to have should be put beyond its reach, or removed entirely, if practicable. Only that which is harmful, or otherwise unsuitable for it, should be denied the child, who should be given the utmost freedom to investigate. Anything once forbidden should be forbidden always; otherwise the les-

son of obedience will be but slowly and imperfectly learned.

Habits are readily acquired; and good habits are so desirable that the effort to establish them is well worth making. But we must not expect to govern the affairs of the nursery by rules, or suppose that all infants may be managed in precisely the same way. While the feeding and the bathing and the care of the child generally should rest upon the principles that we have been considering, knowledge of principles is not in itself enough; they must be applied with good judgment, with discretion, above all, with common sense and in appreciation of the fact that the infant is an individual, with individual peculiarities for which due allowance is to be made. But to make the exceptions one must know the rule.

It should be remembered that the young child is the young animal of the human species; its needs are physical. After they have been met, the less attention it has the better. Efforts to amuse it, for the first year at any rate, are misplaced; the spirit of investigation being inherent, and all things new and strange—all equally strange—the infant will find quite enough exercise for its feeble mental powers if left to itself. Teaching should be limited to

the endeavor to establish good physical habits —habits that will contribute to its own and to the mother's comfort and well-being.

Precocity should be discouraged. The accomplished infant is a monstrosity.

CHAPTER XI

Disease in Infants — Infantile Ailments

IN event of sickness, the responsibility should be at once transferred to the physician, who alone is competent to direct the care of the little patient. And the earlier the doctor is called in the better. It is desirable, however, that the mother should have some knowledge of the signs of illness, and be able to distinguish between symptoms of a trivial and those of a serious nature, that, on the one hand, she may not suffer needless anxiety, nor, on the other, neglect to have medical advice in the belief that the services of the physician are not required.

Between the infant and the adult there are certain physiological differences, particularly in the action of the heart as indicated by the pulse; in the respiration and in the temperature, which must be taken into account in determining the degree of illness. In the average healthy adult, the pulse beats about 72 times a minute, and the respirations number 18 per minute; in the infant, the action of both heart and lungs is much more rapid. At the age of one month, the pulse is 130; respirations 42 per minute;

at the age of one year, the pulse is 120; respirations 40. Both decrease in frequency with age, though at five years the pulse is from 90 to 100, and the respirations about 25. In infancy, and to a less degree in childhood also, pulse and respiration are very much accelerated by exercise and by mental excitement; slight ailments, too, especially of the digestive apparatus, are attended by a disturbance of these functions that is altogether out of proportion to the gravity of the disorder. Infants and children develop a high fever also from comparatively trivial causes.

These peculiarities add not a little to the difficulties—of diagnosis in particular—that disease in infancy presents. In event of illness, the little patient can tell us nothing, having "no language but a cry," save by signs that are often misinterpreted. In many cases, knowledge of the real condition can be gained only by a physical examination for which the special training of the physician is necessary.

The healthy infant should be active during its waking hours; its flesh (muscles) should be firm and hard; its skin smooth and elastic; its joints supple; its eyes full and bright; its complexion clear; it should sleep quietly and lie in a natural and easy position, and it should be

good-humored. A "fat" baby is not necessarily a healthy one; on the contrary, accumulation of fat is not desirable, since it interferes with activity. The muscles of a very fat baby are apt to be flabby for this reason, its digestion to suffer, and its powers of resistance to be weakened.

Peevishness, restlessness, drowsiness, indisposition to exercise and amusement are all signs that the child is not well, and as such demand investigation. In cases of illness much may be learned by careful observation of the attitude, movements, facial expression, etc.

Carrying the hand to the head, pulling the hair, rolling the head uneasily on the pillow, are signs of pain in the head; firm retraction of the head, flexure and rigidity of the limbs, spasm of the muscles, and a shrill cry indicate serious brain disease; a disposition to lie so as to make pressure on the abdomen and flexure of the thighs on the abdomen are evidences of abdominal pain; rubbing the nose and grinding the teeth are signs of intestinal irritation from some cause; forcibly striking the nose is a symptom of brain trouble (this movement appears to be the precursor of convulsions in some cases). Squinting, when not dependent on defect of the muscles of the eye, indicates brain disease. A downward direction of the eyes, smallness of the

face, and great expansion of the cranium are signs of "water on the brain." Enlargements at the joints (the ends of the long bones), a large, square-shaped head, and delayed dentition are signs of rickets.

In pleurisy and pneumonia the voice is restrained and abrupt, and the breathing rapid and shallow; in croup, or when the windpipe is obstructed, hoarse and metallic. Moaning is characteristic of diseases of the intestinal canal. A "sharp, shrill, and solitary" cry indicates very serious brain trouble. Continued crying without discoverable cause, the child being well apparently, is likely to be due to earache.

In brain disease, the expression of the upper part of the face is involved: the brows are contracted; the eyes fixed, squinting, or vacant. In affections of the heart and the lungs, the nostrils dilate with the inspirations; the lips are blue; there are dark rings under the eyes. In abdominal diseases, the mouth is drawn; the lips pale or livid; the cheeks sunken.

INFANTILE AILMENTS

The infant is peculiarly liable to certain ailments and disorders, some of them of but little importance in themselves, but which, nevertheless, may seriously interfere with its

comfort and well-being, and add very much to the mother's burdens. Some of these disorders are due probably to developmental changes; but many proceed from causes that may be prevented, or, at any rate, removed, once they are determined, as they should be always, if possible. Slight disorders are often neglected for no better reason than that all or most babies have them; they are regarded as necessary evils—like the cutting of teeth.

A fretful baby is rather likely to acquire reputation in the family as a "cross" baby, who must be humored, but ought to be disciplined. Both methods of treatment are wrong, however; for unless a peevish habit has been established as a result of continued illness, or other sufficient cause, fretfulness means discomfort, or pain from some source; it is abnormal, for the normal infant in health is "good." The little one may be fussy at bed hour from weariness and cry lustily at times in wrath, but exhibitions of this nature are quite normal for most of us, and most babies have all too frequent cause for righteous indignation. But the vigorous crying that relieves the mind probably, and expands the lungs certainly, is one thing; the "worrying" of the fretful baby is quite another and a different matter altogether, of which the cause must be

sought diligently: it may be discomfort merely, as from some fault in the clothing or the dressing; it may be hunger or thirst; or, as perhaps most commonly, slight indigestion; and it may be, also, an early sign of very serious disease.

Hunger, as already pointed out, may depend upon over-frequent feedings, or upon lack of a sufficient amount of proteins in the food. In the former case, particularly, symptoms of indigestion are usually present, viz.: regurgitation of food, vomiting, "wind on the stomach," distended abdomen, diarrhœa (or constipation), the presence of whitish masses, or lumps, in the stools, etc. These symptoms are generally due to errors in diet, and the correction of these errors is the sufficient remedy in most instances, though medical treatment also may be necessary. Indeed, whenever there are evidences of disordered or diseased conditions, it is always best to consult the doctor without delay; for while it almost necessarily belongs to the mother and the nurse to keep the baby well, the care of the sick baby demands the special knowledge and training of the physician.

If discomfort, hunger and thirst, and abdominal pain from indigestion can be eliminated, fretfulness is most likely to be caused by earache, though in inflammatory disease of the ear, the

pain rapidly becomes so severe that the child cries from it. Again, it may mean beginning disease of the spine, or of the hip, or other joints; in this event, the infant usually has fits of crying, or screaming, during the day, and, particularly, cries out in its sleep at night. This cry, or scream, in the night is so characteristic that its repeated occurrence calls imperatively for examination by the surgeon that disease, if present, may be discovered and treated at once.

If the infant frets, or cries, when taken up, or moved, the possibility that it is suffering from scurvy should not be overlooked.

Disorders and diseases to which the youngest infants are especially subject are: jaundice, constipation, diarrhœa, regurgitation of food, "wind colic," inflammation of the eyes, of the skin, and of the breast.

JAUNDICE

Although referred to as a disease, jaundice is a symptom of disease, or disorder. In the youngest infants it is usually caused by a functional disturbance of the liver. It is recognized by the yellow discoloration of the skin and eyes to which it gives rise. This appearance is apt to give the mother a good deal of anxiety; but it is of no importance and disappears in a few days without treatment.

CONSTIPATION

In the case of the youngest infants, constipation may be overcome sometimes by giving water in the morning before any food is taken, and through the day immediately after each feeding or nursing. In the preparation of food for the bottle baby, oatmeal water should be used as the diluent rather than barley water or plain water. The percentage of fat in the food may be increased; or if already large, decreased; and the percentage of proteins diminished, with benefit in many cases.

A small piece of castile soap, or of molasses candy, inserted into the rectum is often useful. Rectal injections of water are of small service because the rectum holds so little; the addition of a little glycerin—ten or twelve drops—to the water makes it more effective. Glycerin is indicated particularly if the excrement is dry and hard. A teaspoonful, more or less, of olive oil may be thrown into the rectum with good results; and the injection, once a day, of a small quantity—five to ten drops to begin with—of olive oil *to be retained*—the amount to be increased gradually, if necessary, up to as much as the rectum will tolerate—is very often curative. The injection is best made at bedtime, as the infant should be as quiet as possible after receiving it.

Purgatives should not be employed in this condition; they only add to the trouble. Castor oil, so useful as a laxative in many conditions on account of its astringent after-effect, is to be avoided in the treatment of constipation.

SIMPLE DIARRHOEA

In the youngest infants this disorder seldom calls for medicinal treatment. The daily quantity of food should be reduced, and the food should be further diluted—this may be done by giving a few teaspoonfuls of water directly after each feeding. Generally, also, the percentage of fat in the food should be decreased.

From two to four movements of the bowels in twenty-four hours may be regarded as normal. Indications of intestinal disorders or disease requiring medical advice are: frequent movements, particularly if they are accompanied by straining or vomiting, with the presence of mucus, blood, shreds of membrane, or curds in the discharges. At all ages, looseness of the bowels furnishes an indication for an immediate reduction of the quantity of food, particularly of the quantity of the fat.

REGURGITATION

Occasional regurgitation (spitting up) of food immediately after a feeding is perfectly

compatible with health, and may be conservative; if more food has been taken into the stomach than can be digested, it is certainly better that the excess should be rejected. The bottle baby almost always swallows air with food; when the air is expelled from the stomach some of the food is likely to be expelled with it. This may often be avoided by raising the infant to the sitting posture immediately after the food has been taken—when the air will be at once discharged by itself.

Persistent regurgitation of a considerable quantity of the food calls for treatment; the trouble may come from over-feeding; from insufficient dilution; from too much fat in the food, or from fermentation of the food in the stomach (though in this case, the regurgitation does not occur immediately). The remedial measures must be directed accordingly: if, in the case of the infant at the breast, the milk is too rich, a few teaspoonfuls of boiled water may be given immediately before or after each nursing; if the regurgitation is caused by over-feeding, the intervals between meals should be lengthened; if to fermentation, extraordinary pains should be taken to insure perfect cleanliness of the nipples—or of the bottle—and of the mouth also, and appropriate remedial measures adopted to prevent

it. If substitute-feeding is employed, the milk supply should be looked after.

INFLAMMATION OF THE EYES

The eyes of the youngest infant are extremely sensitive; exposure to bright light or contact with slight irritants, as soap, for example, may give rise to inflammatory trouble of considerable severity. The introduction of foreign material between the lids, an accident that sometimes occurs in birth, may cause very serious trouble; on this account, careful cleansing of the face and eyes of the child is the first and one of the most important duties of the nurse.

Slight inflammation may be effectually controlled by keeping the little patient in a darkened room, with cold compresses (soft linen cloths wrung out in *cold* water) over the eyes. These compresses should not be so thick as to be burdensome on account of their weight, and they should be frequently changed. If marked improvement does not follow within a day or two the eyes should be bathed in a lotion composed of five grains of borate of soda and 1 ounce of camphor water, a few drops of which should be instilled into them several times a day. Should these measures fail, the case must be referred to a physician without delay.

This treatment applies only to cases in which the inflammation is of a mild grade, with little or no discharge of "matter" from beneath the lids. The affection that begins with considerable intolerance of light and slight swelling of the lids, the child being restless and wakeful, and advances rapidly until, within twenty-four hours perhaps, the lids are greatly swollen, the eyes red, and there is an abundant discharge of pus, with extreme sensitiveness to light—this is an exceedingly dangerous disease, and is likely to destroy the sight if appropriate treatment is not begun at once, and very faithfully carried out. The doctor must be called in immediately. In this condition, the frequent and thorough removal of the pus from beneath the lids is of the utmost importance; they should be separated and the space between them freed from the secretion by a camel-hair brush, or by gentle syringing with tepid water; in the interval, compresses wrung out in ice water and *renewed every two or three minutes* must be kept constantly applied night and day.

INFLAMMATION OF THE SKIN

Inflammation of the skin (dermatitis) and of the breast (mastitis) are among the diseases of earliest infancy. The former gets well without

treatment, and a spontaneous cure of the latter may be expected if the breasts are not irritated by manipulation, or otherwise; the temptation to squeeze the nipple, therefore, must not be yielded to. Should the breasts become hot, swollen, and painful, poultices of linseed meal are advised; in such event, however, the case is one for the physician.

The wax-colored incrustation that appears on the scalp, at the age of six or eight weeks generally, is the dried oily secretion of the sebaceous glands. These glands are very active during the first year, but at the end of this time their extraordinary activity ceases, and the secretions dry up and fall off, leaving the scalp in a healthy condition usually. But the appearance, meanwhile, is unsightly, and the condition is an uncleanly one. The scalp may be cleaned by softening the mass with olive oil, and afterwards washing it off with soap and water.

THE CORD (NAVEL)

If the cord is properly dressed in the first place (see page 6) and is not disturbed afterwards, it dries and drops off between the sixth and the tenth day, leaving a perfectly healed stump. If, instead of this, the part is left moist and "sore," it should be well washed with warm

(boiled) water and immediately dusted with powdered starch which has been heated in the oven for half an hour, or until slightly browned. Under this dressing, a dry scab is soon formed, which, if not interfered with, drops off in a few days, when healing will be found to be complete. Care should be taken that the hands are clean before applying the dressing.

A small bunch, or tumor, at the navel, which disappears under gentle pressure only to reappear when the pressure is removed, indicates a rupture (hernia).

"BLUE-BABIES"

In these cases (cyanosis), the dusky color of the skin is caused by the accumulation of carbonic acid gas in the blood and the lack of sufficient oxygen. This condition results from some defect, generally malformation or lack of development in the heart or in the great central blood vessels. Even when due to malformation, the dusky color is not always apparent at, or immediately after birth, but it usually shows itself before the end of the first week. Exceptionally, cyanosis does not appear until near the end of the period of infancy. The management of these unfortunate cases belongs to the physician.

CHAPTER XII

Infantile Ailments Continued — Accidents and Emergencies

AMONG the common ailments to which infants of all ages are subject are colic and diarrhœa due to indigestion.

COLIC

The attitude of a child suffering from a severe attack of colic is characteristic; it lies with its knees drawn up and the thighs flexed upon the abdomen, the instinctive purpose being to relax the abdominal muscles. The pain is paroxysmal; the child cries out suddenly and as suddenly becomes quiet, the pain passing off. When these symptoms are present the case is one for the physician, who should be summoned at once.

We shall consider only the milder forms of the disorder, which perhaps few babies escape altogether. These are due to the accumulation of gas in the bowels, the result of fermentation (indigestion), in which the pain is probably caused by spasm of the muscles of the walls of the intestines, with perhaps slight over-disten-

tion of them. A discharge of flatus affords immediate relief; the object of our treatment, therefore, is to promote the expulsion of the gas, quiet the pain, and correct the indigestion. The expulsion of the gas may be greatly assisted by massage, which should be employed in this way: One hand is placed at the child's back, the other on the right side of the abdomen, a little above the level of the hip bone; from this point it is moved, with gentle pressure, slowly along the course of the large intestine; that is, directly upwards, thence, on a line that passes a little below the lower border of the stomach, straight across from right to left and down on the left side. These movements are to be repeated until their purpose is accomplished. For the relief of pain hot applications are useful. Dry heat is better, but in the absence of facilities for applying it, flannels dipped in hot water, wrung as dry as possible, and constantly renewed, may be employed. At the same time the extremities must be well warmed. Hot applications to be effective must be made *hot;* at least two pieces of flannel should be provided to be used alternately, and changed as rapidly as they can be heated, or wrung out in hot water, as the case may be, in order that the application of heat may be as nearly continuous as possible. Afterwards,

the abdomen should be covered with a generous piece of dry flannel. A laxative, and none is better for the purpose than castor oil, is needed to complete the cure. The faulty digestion must be corrected, of course, to prevent further attacks. In its severer forms, colic is an exceedingly painful affection, which yields only to the influence of anodynes that cannot be used with safety except under the direction of the physician. The pain of colic is distinguished from pain due to inflammation: (1) by the fact that it comes in paroxysms; (2) it is diminished rather than increased by pressure.

DIARRHOEA

This disorder is often due to the presence of undigested food in the intestines; under these circumstances, it represents an effort of nature to expel the offending material; if the effort is immediately successful, the diarrhœa ceases spontaneously. It is always best, however, to assist nature by the prompt administration of a sharp laxative. Here again castor oil is indicated on account of the after astringent effect produced by it. A good rule is to give a dose of castor oil at the beginning in every case of this kind; it can do no harm and will often avert serious illness. As is well known, diarrhœal

diseases are very common among infants, and very fatal, too; especially during hot weather. Generally, they have their origin in indigestion; due recognition of this fact and appropriate treatment at the outset would greatly diminish the number of fatal cases.

Upon the appearance of looseness of the bowels give a dose of castor oil; keep the child as quiet as possible; apply heat to the abdomen, and see that it is well covered with flannel (wool); be sure that the diet is suitable, contains nothing that is hard to digest, and *restrict it to the smallest quantity consistent with the maintenance of nutrition and strength.* The quantity of fat in the food of the bottle baby should be reduced; and in some cases may be eliminated altogether—skim milk, diluted with water, or barley water, usually, being employed as the food. Avoid the mistake of attributing the symptoms to "teething," and consult your physician without delay.

It is a part of the routine duty of the mother, or nurse, to examine the dejections carefully at frequent intervals and note their character. The appearance of "curds," or of watery or clay-colored discharges, indicates disorder of digestion. In the case of the bottle baby, "cheesy" masses, or lumps, in the discharges may be due

to the presence of large numbers of bacteria in the food (milk); that is, the milk in use is not "clean." Generally, the food or the digestion is at fault if the infant has more than four movements of the bowels in the twenty-four hours. Greenish stools, provided they are normal in other respects, have no special significance; the discoloration, probably from the bile, is supposed to be due to developmental changes in the liver, or affecting the liver. These changes appear to be responsible, also, for mild cases of simple diarrhœa in some instances.

Foul air and exposure to cold, or "draughts," are recognized as among the causes of diarrhœa. Continuous hot weather, particularly hot and "muggy" weather, predisposes to and may be the direct cause of diarrhœal diseases. Pure air and comparative coolness are of the greatest assistance, and often, indeed, essential to the successful treatment of these conditions. In cases of infants suffering from these intestinal diseases, a change from city to seashore is usually followed by immediate improvement within a few hours.

CONSTIPATION

Constipation is often an exceedingly troublesome affection. Ordinarily, the infant should

have at least a daily movement of the bowels; in some cases, however, an evacuation every second, or even every third day, seems to be all that is necessary for the maintenance of health; efforts to secure a daily movement may be misplaced therefore. Ordinary constipation may be due to a variety of causes; among them are muscular inaction from lack of bulk in intestinal contents—because of the small amount of food taken, or of a small amount of waste material in the food; insufficient water; scanty secretions, etc. In younger infants it may be due to too little fat, or to too much fat in the food; in event of the latter, the stools are large and grayish white in color.

Constipation usually comes on gradually, and is likely to become more and more troublesome and less and less amenable to treatment; the earlier remedial measures are taken, therefore, the better. In the first place, faults in the diet, if any, should be corrected. Generally, more water should be given; water drunk in the morning before any food is taken is especially useful. Among suitable foods for the infant, after the first year, the following may be employed for their laxative effect: beef, chicken and mutton teas; oat jelly; baked apple and dried fruits of different kinds; prunes; preparations of malt,

which also promote digestion, and cream, which may always be added to the milk if necessary. Of these foods oat jelly and beef tea may be given to the youngest infants, and to infants at the breast. Baked apple may be given early, too. Frequent gentle kneading of the bowels is often of great assistance; this may be done several times a day for several minutes at a time.

Measures of treatment that are appropriate in earliest infancy are referred to elsewhere. Most of these measures are useful generally. In the case of older infants rectal injections of water are much more effective, the rectum being larger; some physicians depend upon them almost entirely. Gluten suppositories give very satisfactory results in a large number of cases; and they may be employed continuously, if need be, without doing harm. The daily injection and retention of a small quantity of olive oil is often curative.

Nothing contributes more to success in preventing and in overcoming disorder of this function than strict regularity in its performance; as soon, therefore, as the child comprehends the uses of the commode, it should be placed on it at the same hours every day, to the end that a habit of evacuating the bowel at regular intervals may be formed.

The mother is particularly cautioned against the administration of cathartics in the treatment of constipation. Castor oil, and full doses of rhubarb, so useful in their places, are not only valueless as remedies for constipation, but they invariably add to the difficulty.

"COLD IN THE HEAD"

This is a very common affection. A chronic "cold" is usually dependent upon inherited "blood disease." Generally, the ordinary "head cold" is serious only so far as it interferes with nose-breathing and, therefore, with nursing in very young infants; and the only treatment necessary is a mild laxative (one of the preparations of rhubarb is best here; castor oil has the effect to increase the secretion of mucus), a hot foot-bath, and inunction of the nose with vaseline. If, however, the inflammation is attended by swelling of the parts enough to prevent nasal breathing, the services of a physician are required, and that without delay. Washing out the nostrils with a weak solution of salt in water affords relief, and may serve to prevent the swelling.

BRONCHITIS

Acute bronchitis may be of little importance in the case of the adult, but is a very dangerous

disease in infancy and calls for prompt medical treatment.

DISEASES OF THE MOUTH

Inflammation of the mouth, ranging from "sore mouth" to ulceration, is one of the common diseases of the ill-nourished and ill-cared-for from which healthy and well-kept infants are comparatively exempt. A sore mouth from mechanical irritation—as, for example, a roughened nipple—that in the case of the healthy infant gets well without treatment, aside from local cleanliness, may be the beginning of very serious inflammatory disease in the case of the feeble and sickly infant in spite of treatment.

Thrush (or sprue) is a disease of the mouth, usually; though it may invade the throat also, and sometimes extends into the œsophagus. It may be recognized by the appearance of slightly raised, grayish white patches on the inner surfaces of the lips and the cheeks and on the tongue. These patches look very much like masses of curdled milk; but they are quite firmly adherent, while the milk curds are easily wiped off.

Thrush is due to the growth of a fungus—one of the family of vegetable parasites of which mold is composed—which may be conveyed by anything not perfectly clean that is put into the mouth; but if the mouth itself is clean, and in a

healthy condition, and the infant well nourished and vigorous, the parasite is not likely to effect permanent lodgment, and the disease will not be developed.

As in the case of so many infantile ailments, ignorance, or carelessness, or neglect is very largely responsible for diseases of the mouth. Under all conditions, local cleanliness is the best preventive; it is, also, an essential part of the treatment always. These cases should be referred to the physician, of course. If his services are not immediately available, the following lotion may be employed in all inflammatory conditions of the mouth, and in thrush also:

Borate of soda	½ drachm
Glycerine	¼ ounce
Water	4 ounces

This mixture should be applied freely by means of a medicine dropper, or on a swab of cotton, at intervals of an hour or two.

If the lotion cannot be obtained at once, a solution of cooking soda, if pure, prepared by dissolving a level teaspoonful of soda in a cupful of hot water, may be substituted.

DISEASES OF THE SKIN

Local irritation and disorders of digestion are prolific causes of these affections. Eczema

and erythema, both of which appear under many different forms, are oftenest encountered. In the youngest infants they are generally due to neglect, or carelessness, or ignorance on the part of the nurse. Ill-nourished children are especially subject to them, though none are exempt. Contact with acrid discharges, the friction of coarse underclothing, the use of soaps of inferior quality, lack of cleanliness, on the one hand, and over-frequent bathing with soap, on the other, by which the natural fat of the skin is removed, are among the common causes of these troubles. The preventive measures to be employed are obvious. The notion that harm may be done if these eruptions are cured—that they may be "driven in," whatever that may mean—is utter nonsense. The idea probably arose from the fact that the premature fading of the eruption in measles is often associated with the development of unfavorable symptoms; but in these cases the sudden disappearance of the rash is the effect not the cause of increased severity of the disease.

As a rule, diseases of the skin are not accompanied by rise of temperature; this fact and the absence of indications of increasing illness serve to distinguish them broadly from the eruptive fevers. Discussion of the diagnosis and treat-

ment of these diseases would be manifestly out of place here; it may be said, however, that immediately upon the appearance of an eruption, the part involved should be protected from irritation as far as possible; the common sources of irritation have been mentioned.

RICKETS AND SCURVY

Among infantile diseases there are two which, though they cannot be reckoned as slight ailments, may properly be referred to in view of their cause and of the importance of their early recognition and treatment. They are rickets (*rhachitis*) and scurvy (*scorbutus*). Both are intimately associated with impaired nutrition. Rickets shows itself generally between the ages of six and twenty months, though it may appear at any age, and may be congenital. Its most marked manifestation is found in alterations of the bones, which are softened; at the same time, the ends of the long bones—the thigh bones, for example—are enlarged. A large, square-shaped head (skull), with high forehead and open spaces between the bones, is quite characteristic, and an open fontanelle after the age of eighteen months is very significant of rickets. Dentition is delayed. The disease is painless usually. Recovery is slow, but under

proper treatment may confidently be expected—usually, by the end of the third or fourth year.

Scurvy, also, usually develops between the ages of six and eighteen months. For some time before the disease declares itself, the infant looks pale and suffers more or less from disorders of digestion. Generally, tenderness or soreness of the bones is the first symptom that is noticed; as the disease progresses, the limbs, particularly, become so sensitive that the child shrinks from the least movement. Swellings appear near the ends of the bones of the legs and of the arms. Discolorations due to hemorrhages beneath the skin and in the deeper parts are frequently observed. Bleeding from the gums and an ulcerative inflammation of the gums and the mouth are very constantly associated with the disease.

Scurvy is always due to imperfect nutrition. It is seldom found among infants at the breast—never if the breast-milk is sufficient in quantity and normal in character. Bottle babies who have been deprived of fresh cows' milk are particularly liable to it. Unless the disease is far advanced, rapid improvement and complete recovery follow appropriate treatment, of which the administration of fresh fruit juices (preferably orange juice) is an essential part.

DEFORMITIES

Reference is made to minor deformities only —that may readily be prevented, or corrected, at the outset. The greater number of the bones is developed from cartilage (gristle) by the deposition of lime salts. The process by which the conversion of cartilage into bone is made, called "ossification," is a very gradual one—so gradual that it is not everywhere complete until maturity. At birth, many bones that afterwards become very firmly knitted together are not united at all; thus, there are wide spaces between certain bones of the skull, and the large opening —called the *anterior fontanelle*—toward the front of the middle line of the cranium does not close normally until about the eighteenth month. In infancy, and to a lesser degree in childhood, also, all the bones are comparatively soft, and so flexible that they are easily bent; accordingly, slight pressure, if exerted in one direction always, may cause deformity. Curvature of the spine may be caused by holding the infant on the same side always, and "bow-legs" by premature standing or walking.

Such deformities ought to be prevented, of course; if they are allowed to occur, they may be corrected easily in the beginning. In the case of bow-legs, straightening the limbs by

manipulations may be sufficient; if not, a suitable mechanical device should be employed. But the correction of deformity never should be left wholly to nature. An abnormal condition of the bones, such, for example, as obtains in rickets, increases the liability to deformity.

Unnatural protrusion of the ears is not uncommon. In these cases the ears may be kept flattened against the sides of the head by the pressure of a cap, or other device for the purpose. If this method fails, the deformity may be corrected by a surgical operation.

TONGUE–TIE

Sometimes the fold of mucous membrane that passes from the under surface of the tongue, near its tip, to the floor of the mouth is so short, and the movement of the tongue so restricted in consequence, that the power of suction is interfered with. In these cases, the fold, called the "frænum" (bridle), must be cut. This little operation is without risk.

It may be remarked that tongue-tie, or other minor local defect, is seldom if ever responsible for retarded speech. Usually the infant begins to form words early in the second year; but, in the absence of brain trouble, and provided the hearing is good, there is no occasion for anxiety

even if the power of speech is not developed in infancy. Indeed, a child perfectly normal in other respects may not be able to "talk" before its third, or fourth, or even its fifth year.

RANULA

Occasionally a soft, fluctuating tumor, faintly blue in color, appears under the tongue. It is caused by the blocking of the duct of a small gland. Removal is a simple matter.

THE HEAD

The head of the infant immediately after birth is almost always more or less misshapen as a result of the pressure to which it has been subjected; the scalp often presents swellings, also, which add to the distortion. But these deformities are only temporary; they soon correct themselves, and should be left wholly to nature.

BIRTHMARKS

The appearances commonly known as birthmarks, or mother's marks, are of two kinds: (1) a strawberry-like tumor, slightly elevated above the surface of the skin; (2) a spot, or patch, of red or purple discoloration. Both consist of small blood vessels for the most part.

The first variety has a tendency to increase in size, and involves danger from hemorrhage, which is likely to be serious, and may be fatal. These tumors should be removed early, on this account. The second variety may be merely spots, or points of discoloration, not larger than a small pin-head, and they may be as large or larger than the palm of the hand; in either case, they seldom grow larger, and, unless so situated as to be unsightly, do not call for treatment.

MOUTH–BREATHING

Naturally the infant breathes, as it should, through the nose. Mouth-breathing invites disease of the throat and of the respiratory track, and is altogether pernicious in its effects. Cleansing the nostrils should be a routine part of the toilet from the outset. But free passage of air through the nasal cavities is very often interfered with by growths of glandular tissue—called adenoids—in the upper part of the throat, behind and above the soft palate. These growths may be so extensive as to block the nasal cavities completely from behind, so that nose-breathing becomes impossible. They may prevent, also, the entrance of air into the small tubes, one on each side, that extend from the throat to the middle ear, thus serving as the

primary cause of the diseases of the ear to which impairment of the hearing is most frequently due. In some cases they give rise to a peculiar deformity of the face from protrusion and narrowing of the upper jaw. And for some unknown reason they sometimes interfere with the mental development.

The removal of adenoids is easily accomplished by an operation that is practically without danger, and from which the recovery is prompt and perfect. Generally, the growths once removed do not recur. The habit of mouth-breathing during sleep may be acquired, the nasal passages being perfectly free; and after the removal of nasal obstructions, the mouth often falls open in sleep from relaxation of the muscles. Special devices for holding the mouth closed are furnished by dealers in surgical instruments. A very simple one is applied by passing two rather narrow strips of adhesive plaster diagonally across the mouth from the upper to the lower lip—the strips should be crossed in the middle line.

Other habits, as, for example, "thumb-sucking," and habits of posture and movements, may give rise to deformities, if they are allowed to become fixed. In most instances the requirements for a cure of the fault are plain enough;

but a remedy at once effective and appropriate is not always easily found. Each case must be considered by itself.

THUMB–SUCKING

Industrious thumb-sucking may cause protrusion of the upper teeth, or of the upper jaw, particularly if there are "adenoids." A great many different measures are employed in the effort to break up this habit, of which painting the thumb with a solution of some bitter drug, quinine, for example, is commonest; but it frequently fails. Wrapping the thumb in adhesive plaster—surgeon's plaster—often proves to be an efficient treatment.

CARE OF THE MOUTH

The importance of keeping the mouth of the young infant clean to prevent local disease from irritation due to the fermentation of adhering food, has been referred to, and the same care should be exercised throughout the periods of infancy and childhood. It often happens that the first teeth, or some of them, come through the gum before the enamel—the very hard substance that covers the exposed portions of the teeth—is fully developed; these teeth are liable to decay very soon after their eruption. Decay

of the teeth is caused by bacteria, for whose growth particles of food that find lodgment between them furnish a suitable soil. These particles should be removed by the use of a toothpick of soft wood and a toothbrush. Breaks in the enamel should be stopped at once by a "soft filling," which not only preserves the teeth, but prevents future suffering from toothache. During the second year the infant may be taught to use the toothbrush for himself.

RUPTURE (HERNIA)

Rupture, or hernia, means the protrusion of some part of the contents of the abdominal cavity, usually a small portion of the intestines, through the abdominal walls. There are several weak spots in these walls and, therefore, several varieties of hernia. In the case of the infant, hernia appears oftenest at the navel (umbilical hernia), as a small, soft lump (tumor) that usually disappears under slight pressure of the fingers, returning as soon as the pressure is removed. Occasionally the rupture is in the groin. The condition is not a serious one, though it may become so if neglected or badly managed.

As soon as a rupture is discovered, the case should be referred to a physician; for while

the opening in the abdominal wall may close of itself, there is no assurance of it; moreover, until the intestine is returned to its place and held there by a suitable support, there is risk of complications that may involve great danger to the child. The reduction of a rupture by force never should be attempted; only the gentlest manipulation is permissible in any case. Early treatment is usually very simple and promptly successful. In many cases of umbilical hernia, a strip of adhesive plaster properly applied furnishes a sufficient support.

CIRCUMCISION

In infancy, the foreskin is normally slightly adherent to the part—called the glans—which it covers; later, these adhesions disappear naturally, as a rule. But an extensive and close adherence of the foreskin may interfere with the escape of the urine, and give rise to local inflammation, or to irritation sufficient to cause serious disturbances of the nervous system; even convulsions may be due to this cause. In event of nervous disorders the condition of these parts should be inquired into always.

The adhesions may be broken up forcibly, or a portion of the foreskin may be removed by circumcision. This little operation should be done

in the interests of cleanliness when the opening of the foreskin is so small that the glans cannot be freely exposed for the removal of the secretions that gather behind it. In the female, the analogue of the penis is provided with a foreskin also, which, as in the male, may be so firmly adherent to the underlying parts that similar treatment is necessary, for the same reasons.

HICCOUGH

Hiccough is a spasmodic or convulsive movement of the diaphragm. The diaphragm, which is composed of muscle and tendon, forms the partition between the cavity of the chest and the cavity of the abdomen, and is the chief muscle of respiration. Spasmodic contractions of this muscle may be due to a great variety of causes. Unless it is associated with some disease, hiccough is usually caused by indigestion. The occasional attack in the healthy infant may be cut short by giving a sip of cold water; by friction over the stomach; by distracting the attention; but the remedy sometimes employed —startling the child by a sudden unexpected movement, or noise—is "worse than the disease." Frequent attacks of hiccough call for investigation as to their cause.

It should be observed that, with few exceptions, every one of the disorders and diseases that have received special mention proceed from causes that may be and, therefore, ought to be prevented; there could be no more impressive witness to the need and the value of a knowledge of right principles of infant care and infant feeding on the part of those who are immediately responsible for the health and the life that so often depend upon it.

ACCIDENTS AND "EMERGENCIES"

The disposition that most babies have to put all sorts of things into the mouth, and sometimes to force small bodies into the nose or into the ears, exposes them to peculiar dangers. The common practice of carrying all possible objects of interest to the mouth is explained, probably, by the fact that the sense of touch is keenest at the tip of the tongue. Foreign bodies put into the mouth are usually swallowed, if not rejected; but they may be drawn into the windpipe by a forcible inspiration.

If swallowed, provided they are small enough to get through the gullet into the stomach, as they generally are, they will go the rest of the way without any difficulty, as the gullet is the narrowest portion of the alimentary canal.

If a pin, or other object that has sharp points, a roughened or a cutting surface, is swallowed, the child should be induced to take a quantity of absorbent cotton, well "picked apart," if possible. This may be given in milk. In any case, neither emetics nor laxatives should be given. As a rule, no harm is done if the case is left wholly to nature.

If a foreign body enters the windpipe, the accident is a very serious one, unless it is expelled at once by the violent coughing that immediately follows. The treatment must be prompt. Sometimes a sharp blow between the shoulders will dislodge the object; if this is not immediately successful, the child should be held by the feet and legs, head downwards, and gently swung to and fro in this position while two or three light blows are given with the open hand between the shoulders. This measure should not be repeated; if it does not succeed the first time, a surgical operation offers the only chance for life.

Foreign bodies in the nose seldom give rise to serious trouble. Sneezing will generally dislodge them, and this may be provoked by tickling, or by putting a little snuff into the free nostril.

Foreign bodies in the ear speedily excite

inflammation, which may be followed by serious and even fatal results, as it is liable to extend from the external canal to the ear drum and thence through the middle ear to the brain. Small bodies may be removed by freely but gently syringing the ear with warm water. A probe ought never to be used because of the danger of piercing the ear drum. Insects may be gotten out by excluding the air; for this purpose a little warm oil or warm water may be poured into the ear, or the ear may be plugged with cotton saturated with a warm solution of salt and water, the patient being turned on the affected side. After a few minutes the plug may be removed, generally with the insect embedded in the cotton.

Particles of sand, or other material, may be removed from the eye when lodged under the upper lid by grasping the lid firmly, lifting it away from the eyeball and pulling it well down over the lower lid. As it slides back into place the offending substance will often be dislodged, when it will be found clinging to the lower lashes. This little maneuver may be repeated several times without risk of doing harm.

FALLS

Though the infant is particularly liable to slight accidents, it usually escapes serious injury

on account of the great elasticity of its bones. A fall, however, may be followed by very serious consequences if either the brain or the spine is injured. In case of a severe fall it should not be hastily concluded that no harm has been done, as symptoms may not develop until some time afterwards; for several days, therefore, the child should be kept as quiet as possible. Concussion of the brain, which may result from a blow on the head, is quickly followed by unconsciousness; the skin is pale and cold; the respiration sighing; the pupils contracted, or unequal; the pulse very rapid and feeble. Should such symptoms appear, the sufferer must not be disturbed, but kept in the horizontal position, with the head low; the clothing should be loosened over the chest; a hot plate put over the stomach and hot bottles to the extremities, which may be rubbed briskly at the same time to stimulate the circulation. Vomiting means that "reaction" is setting in, when effort at stimulation should cease; the treatment of this stage (reaction) must be directed by the physician.

BRUISES

A bruise may be treated by very hot or by very cold applications, and by pressure. Only dry heat should be applied. The pressure of a

coin or other hard substance has a tendency to prevent discoloration by distributing the effused blood which gives rise to it.

WOUNDS

Wounds, however slight, should be thoroughly cleansed before they are dressed, and all foreign material carefully removed. Mopping the part with tepid water promotes bleeding, which, to a moderate amount, is desirable for cleansing the wound; it may be controlled by making firm and continuous pressure over the wound by means of a compress (a firm pad of perfectly clean cloth), which may be wrung out in very hot water or in very cold water. Hemorrhage from an artery is distinguished by the color of the blood, which is bright red (crimson), and by the fact that the blood spurts from the severed vessel with considerable force, which may be increased at regular intervals that correspond with the pulsations of the heart. This kind of hemorrhage may be checked by compressing the artery somewhere in its course between the heart and the wound; for example, bleeding from an artery in the arm may be stopped by placing a large book well up under the arm and keeping the limb firmly pressed against it; bleeding from the leg, or foot, by raising the limb and flexing

the knee-joint over the back of a chair so that pressure will be made behind the knee where the main artery is situated. The arteries in either extremity may be compressed, also, by tying a handkerchief around the limb above the wound, a compress being placed directly over the course of the vessel from which the blood comes, and twisting it tightly with a stick inserted at right angles. In case of bleeding from a large, gaping wound, picked lint, or clean rags, should be packed closely into the wound and firm pressure made over it by means of the fingers, or by a compress and bandage. All these measures are merely temporary, of course; but they are of universal application.

NOSEBLEED

Find out from which nostril the blood comes, and hold the hand and arm of that side above the head; at the same time, pinch the nose between the fingers and apply cold to the forehead. The object of these measures is the formation of a clot within the nostril. Immersion of the hands or the hands and feet in hot water is helpful. After the bleeding has been checked the child should be kept quiet that the clot may not be dislodged.

STINGS OF INSECTS

These are best treated by cleansing the part and sponging it with strong water of ammonia or with soda water. The sting of the honey bee is left in the wound; it should be removed.

CONVULSIONS AND SPASMODIC CROUP

In view of the suddenness and severity of the attack in these cases, convulsions and spasmodic croup may be reckoned among "emergencies." The latter affection is rather a disease of early childhood than of infancy, occurring most frequently between the ages of two and five years.

Premonitory symptoms of convulsions are drowsiness, fretfulness, disturbed sleep, moaning, movement of the jaws, and, especially, muscular twitching. The eyes often have an unnatural appearance, and at intervals the child may look fixedly at surrounding objects, but, apparently, without seeing them. If the seizure is caused by the presence of worms, or other irritant in the intestines, the abdomen is likely to be distended, also. Upon the appearance of this group of symptoms, endeavor should be made to secure prompt evacuation of the bowels; this will sometimes abort an impending attack. For this purpose a rectal injection of salt and warm

water may be given, or a full dose of castor oil, or both.

Upon the occurrence of a convulsion (unless it happens during the progress of well-defined illness, when the physician will have prescribed the treatment; or is clearly due to brain trouble, when treatment, unhappily, is of no avail) the child should be quickly immersed in warm water (100° to 105°), to which a teaspoonful of mustard may be added. It should be kept in the bath from ten to twenty minutes, cold water being applied to the head meanwhile. As soon as the convulsive movements cease, the injection of salt and water should be given, unless already administered. Injections should be made with the infant lying on its left side, as this position has the effect to increase the capacity of the rectum, and the fluid is less likely to be rejected; a napkin firmly pressed against the outlet for a few minutes will assist its retention. To clear the bowel, from 2 to 4 ounces of water (four to eight tablespoonfuls) should be used. Care should be taken to prevent the entrance of air with the water.

In every instance, careful inquiry should be made as to the cause of the seizure, that it may be removed if possible, and further attacks prevented.

Spasmodic croup ("false croup") is a disease of childhood rather than of infancy. It is mentioned here because it is important to distinguish it from "true" (membranous) croup. False croup may be caused by intestinal irritation, though a "cold" is oftenest associated with it, and it is generally preceded by a slight cough. In the case of vigorous children, this disease is never dangerous in itself, nor is it likely to be followed by serious results. The attack, however, is very often alarming. Generally it comes on very suddenly, and almost always during the night, the child waking from a sound sleep with a hoarse, sonorous cough and husky voice, struggling for breath; the face, flushed at first by the violence of these efforts, soon becomes dusky, and the extremities cold. After a time, from one to three hours, the spasm relaxes and the little sufferer again breathes quietly, perhaps falls asleep; but the attack may be repeated after a few hours.

These distressing symptoms are caused by spasmodic contractions of the muscles of the throat which interfere with the free passage of air to the lungs, and the immediate treatment should be addressed to the relief of this condition. The spasm may be relieved by an emetic (Syrup of Ipecac in teaspoonful doses, repeated

every twenty minutes until emesis occurs), or by the warm bath given as directed under convulsions; or both may be employed. Cloths wrung out in cold water may be bound about the throat, also, for the same purpose. After-treatment is generally called for on account of the inflammation usually present. In cases of children who are especially subject to this affection, the nose and throat should be thoroughly cleansed before they are put to bed for the night, whenever they have a "cold"; attacks may sometimes be prevented by this simple proceeding. A spray of salt and water, or of *Dobell's Solution,* may be used for the purpose.

TRUE (MEMBRANOUS) CROUP

This is a far more serious disease. Spasmodic croup comes on suddenly; true croup, on the contrary, develops gradually, the symptoms, which may be very slight in the beginning, steadily increasing in severity; in this disease the cough is harsh rather than loud, and the voice, becoming weaker and weaker as the disease advances, may be lost altogether. In true croup, the obstruction is caused by a membrane, which may be seen in the throat, or in the material coughed up, usually; the membrane is generally if not always "diphtheritic"; that is, the disease is diphtheria.

EARACHE

Earache may often be relieved by pouring a little warm water into the affected ear, afterwards plugging it with a bit of cotton. Heat should then be applied by means of a salt or sand bag.

REMEDIES

A few simple remedies may be kept at hand with advantage:

Castor Oil (dose one teaspoonful, or more) is both safe and efficient as a cathartic. Its astringent after-effect makes it peculiarly useful in the treatment of infantile disorders, as its purgative action involves no risk of setting up diarrhœa.

The Compound Mixture of Rhubarb and Soda, prepared according to Squibb's formula, is an excellent remedy in cases of slight indigestion, and as a mild laxative. The dose, for infants, ranges from one-quarter to one teaspoonful. The smaller doses may be given after each feeding, or after each alternate feeding, in cases of "sour stomach," flatulency, etc. As a mild laxative, a teaspoonful may be given, and repeated at intervals of four hours until effective. Like castor oil, rhubarb, as a laxative, has an astringent after-effect; it is useful, therefore, in the same conditions.

Syrup of Ipecac in teaspoonful doses is a reliable emetic. This dose may be repeated every twenty minutes until vomiting occurs.

Anise Cordial, or the following "baby mixture"—which, of course, contains no opium, is useful in cases of colic:

Asafœtida	8 drops
Bicarbonate of soda	8 grains
Anise cordial	2 drachms
Water	1 ounce

These ingredients are to be mixed together.

The dose of this mixture is from one-quarter to one teaspoonful in a few teaspoonfuls of hot water; it may be repeated several times at short intervals, if necessary. Hot external applications should be used at the same time.

Camphorated Oil, for external use, is a mild "counter-irritant," serving the same purpose that the mustard plaster serves in the case of the adult.

The fact that maladies so widely different in their manifestations as spasmodic croup, diarrhœa, and convulsions may be and are often directly due to intestinal irritation, the result of indigestion, emphasizes the importance, repeatedly insisted upon, of giving the most careful attention to the diet throughout the periods of

infancy and childhood. Not health alone, but the growth and development of the child depend upon its having the right kind of food, in suitable quantities, and at proper intervals. Its requirements in these respects are of paramount importance; that they may be met, time and thought must be given to the subject and constant watchfulness maintained. The duty is arduous, but the rewards are ample.

CHAPTER XIII

The Care of the Mother in Pregnancy— Convalescence after Labor

THE physical condition of the mother in pregnancy has an important influence upon that of her offspring at birth. In view of the number of weaklings that are born only to die after a brief, pathetic struggle, and of the frequency with which miscarriage occurs as the result of maternal causes, it behooves the would-be happy mother not only to observe strictly the ordinary laws of health throughout this period, but to take especial precautions in view of her condition. Unhappily, pregnancy does not confer immunity from disease, and extraordinary pains should be taken to avoid exposure thereto at this time. Any disease that impairs the nutrition of the mother interferes with the development of the child; among prevalent maladies, intermittent (malarial) fever has a particularly pernicious influence in this respect. Certain diseases also may be transmitted directly from the mother to the child before its birth.

The dietary during this period should be

generous. Many women in this condition have a craving for certain articles of food; this may be gratified within reasonable limits. Toward the end of pregnancy the number of meals a day may be increased with advantage, the quantity of food taken at a time being diminished accordingly. A daily evacuation of the bowels should be secured; if the use of laxatives is necessary, their selection ought to be left to the physician.

Regular exercise should be taken. While very hard work, particularly lifting heavy weights, running a sewing machine, and washing, must be avoided, the ordinary duties of the housewife may be done with advantage. Riding over rough roads, or in jolting vehicles, a long railroad journey, any sudden jar—a misstep, even—"reaching," straining at stool are among the indiscretions that may be followed by miscarriage; during the week when, ordinarily, menstruation would have occurred, especial care is necessary to prevent this accident. Whenever, in the course of pregnancy, the slightest backache is felt, the expectant mother should lie down immediately, and if any further symptoms appear, at once summon a physician.

All the clothing should be worn loose, and suspended from the shoulders that there may be no compression of the breasts or of the abdomen.

During the last weeks of pregnancy, particular attention should be given to the breasts with a view to the prevention of depressed and "sore" nipples. Only the gentlest manipulation is allowable. The nipples may be toughened by the use of alum and alcohol, or other astringent; but these applications should always be followed by the free use of a bland ointment (a mixture of lanolin and cold cream, 1 part to 3, has been recommended); merely tough nipples are particularly liable to "crack"; they should be pliant, also.

Whatever tends to excite the emotions should be avoided. Although the popular belief as to the effect of vivid maternal impressions is not warranted, cases are not wanting to prove that deformity of the child may be caused by violent emotions of disgust, anger, fear, etc., in the mother, and this dreadful possibility should not be disregarded.

CONVALESCENCE AFTER LABOR

As soon as possible after the birth of the child, complete rest and quiet should be secured to the mother. Sleep, if only for an hour, or less, is especially desirable at this time, and to this end the room should always be darkened. The nurse, with the child, should withdraw as

soon as the patient has been made comfortable, remaining, of course, within call that she may respond at once if summoned.

Especial pains must be taken to avoid mental excitement on the part of the mother. The child may be shown to her if she desires it, but it should not be forced upon her attention. During the first week friends should be rigidly excluded from the lying-in room; even the visits of the husband or nearest relatives should be limited in frequency, and should not be prolonged beyond a few minutes. From the outset, any position that is comfortable may be taken in bed, and the position should be changed frequently.

As soon as the patient is rested somewhat it is well to administer a cup of hot milk, or gruel. For a day or two, or until the bowels have moved and the appetite returns, a diet of milk, gruel, eggs, etc., is all that is required. But the old practice of "starving" the patient is no longer followed; on the contrary, she is directed to have a generous dietary; while for a few days it may be limited to the simpler articles of food, it should be increased gradually until at the end of a week it contains the variety to which she is accustomed. The propriety of this plan is obvious when we consider that not only

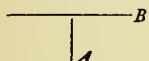
must the needs of her own system exhausted by fatigue and loss of blood be provided for, but nourishment must be furnished for the child, also.

Assuming that precautions have been observed to prevent depressed, or "sore" nipples, care must be taken to keep them in good condition; to this end they should be bathed before each nursing with a saturated solution of borax, and after each nursing thoroughly cleansed with water. If milk is left on them it is apt to "sour," and this not only invites disease of the nipples, but is likely to disturb the child's digestion. Should cracks and excoriations occur (and if the nipple is unduly sensitive close examination in a good light should be made at once, as a very small break in the surface is sufficient to cause a great deal of trouble) the nipple should be painted immediately with compound tincture of benzoin, applied with a camel-hair brush several times a day, and a nipple shield at once provided. Difficulty in getting the child to use this device is sometimes experienced, but it can be overcome by perseverance. The glass should be partially filled with milk expressed by the fingers, before the child is applied, and, while it is nursing, kept in close contact with the breast. It should be needless to say that the shield must

be kept scrupulously clean; it is well to immerse the rubber nipple in a weak solution of bicarbonate of soda when it is not in use.

Throughout lactation the utmost local cleanliness must be observed; it is the most effectual preventive not only of sore nipples, but of the far more serious trouble commonly known as a "broken breast" (abscess). An abscess may be caused by the thickening and subsequent fermentation of the milk in one of the lacteal ducts. It is announced by the appearance of a hard and exceedingly tender and painful lump in the breast. When due to this cause the threatened suppuration may often be prevented by thorough massage of the gland, *which should be done at once* as follows: The breast having been anointed with camphorated oil (this is best, though sweet oil or vaseline will do), the attendant should begin by stroking it very gently from the line of its circumference *towards* the nipple, using the tips of the fingers only. The object of this is to clear the ducts of the thickened secretion. The entire breast should be treated in this way, especial attention being given to the painful spots. As the tenderness decreases, the force of the manipulation should be increased gradually, though it never should be sufficient to cause much pain. As soon as deep pressure

can be borne, or is but slightly painful, the palm of the hand should be firmly applied to the hard spot, which should be gently forced toward the nipple; in this way the duct may be emptied. Whenever the pressure becomes painful it should be discontinued and the stroking movements resumed, the manipulations being kept up until the entire organ has become soft and flaccid, after which a snug bandage should be applied, care being taken that the nipples are not compressed by it. This bandage must be adjusted with the utmost nicety in order that as nearly as possible equal compression shall be made all over the breast.

Numerous special bandages have been devised, but one that may be extemporized as follows is as good as any for the purpose: Two stout pieces of linen are fastened together in the form of a 

; the tailpiece, *A*, should be about four inches wide, and long enough to go a little more than half around the patient's chest. The crosspiece, *B*, should be about twice as long and wide enough to extend from an inch below the breasts to the edge of the areola. To apply this bandage, draw the tailpiece, *A*, underneath the patient's back until the ends appear at the sides directly in the line of the

nipples; the lower end of the crosspiece is then drawn tightly across the chest below the edge of the breast and fastened, with safety pins, to the end of the tailpiece directly below the most dependent portion of each breast. It should be pinned to the binder, also, to prevent its slipping up. The upper end of the crosspiece is then carried across the chest, above the edge of the breasts, and fastened to the end of the tailpiece in the same way; it is prevented from slipping downward by attaching to it two pieces of cloth, (one opposite each breast) which are carried over the shoulders and secured to the tailpiece in the back. The entire surface of the breasts is then dusted with powder and a pad of absorbent cotton placed between them; they are then drawn toward each other by the hands of the patient, and the bandages pinned together, beginning under the arms and advancing toward the nipple, which should be left uncovered, the compression being made as even as possible. The edges of the bandage should be pinned together between the breasts, also. The advantages of this bandage are that it is inexpensive, can be quickly made, does not compress the nipples, and permits the child to nurse while it is in place.

Sometimes too much milk is secreted and sometimes too little for the needs of the infant.

The management of these conditions belongs to the medical attendant; it may be said, however, that among articles of diet, eggs, milk and oatmeal porridge; and among drinks, malt preparations and chocolate are especially valuable for mothers whose milk supply is deficient. Prolonged lactation is harmful to the mother, while the milk in such case is so poor in quality generally that it does not nourish the child properly. Whenever, therefore, lactation becomes exhausting, it should be wholly or partially discontinued, for the milk, even if abundant in quantity, is pretty sure to be lacking in the elements essential for the child's nutrition.

Women not infrequently have trouble in passing urine for the first time after childbirth. The use of a catheter, an instrument for drawing off the water, should be avoided if possible, as it is not without risk of setting up inflammation of the bladder, and because, once the catheter is made use of, the patient may become dependent upon it; it is better, therefore, that she should bear considerable discomfort rather than resort at once to this artificial means of relief. When the bladder has become pretty well distended, she should be placed upon a bed pan, or allowed to turn on her face, in the hope that she will be able to pass the urine naturally. To this end,

also, hot cloths may be applied over the lower part of the abdomen and over the vulva, and gentle pressure employed. At the same time water should be kept running within hearing, as the sound of it has an undoubted influence to provoke micturition.

The discharge from the vagina that follows childbirth, called the "lochial discharge," is for the first few days red in color, from the admixture of blood, and, generally, abundant enough to wet the napkins or pad through three or four times in the twenty-four hours. (Two or three yards of cheese cloth—which should be washed—and a quantity of absorbent cotton, should be provided for making pads upon which to receive this discharge.) After the fourth day, it is decreased in quantity, and becomes pinkish in color, gradually fading to a grayish white, and of a creamy consistency—this being its character at about the end of the ninth day. Normal lochia has a disagreeable odor—quite different, however, from the odor of decomposition; the presence of the latter is an early indication of mischief, and as soon as detected should be reported to the physician. Account should be kept of the number of napkins soiled from day to day, that the physician may be able to judge whether the discharge is more or less than

normal in quantity, and direct his treatment accordingly. The duration of this flow varies; usually it is very slight at the end of two weeks, but may continue quite abundant for a month, or more, without necessarily bad results. The reappearance of the sanguineous flow, however, is indicative of laceration, or other trouble, and the attention of the physician should be called to it at once, the patient meanwhile keeping recumbent and as quiet as possible.

Cleanliness in the lying-in chamber should be insisted upon. The face and hands of the patient should be washed twice a day and the entire body bathed once a day with a sponge, only a part of the body being exposed at a time. The popular notion that combing the hair during the first week is likely to excite hemorrhage is without foundation; of course the patient is not permitted to dress the hair herself, or to raise her head from the pillow while it is done.

Some women suffer acutely from "after-pains" caused by persistence of uterine contraction after delivery. These pains seldom occur at the first confinement, and are most troublesome in women who have borne several children. They need occasion no anxiety, their local effect being rather salutary than otherwise, since the contractions tend to the expulsion of clots,

or other material that may be contained in the uterus; they are not, however, to be regarded as evidence that the uterus is thus occupied. If they are very severe, relief may be had, pending the arrival of the physician, by the application of hot cloths over the abdomen.

Ordinarily the patient should remain in bed for about two weeks. After the tenth or the twelfth day, she may sit up in bed, bolstered with pillows, for a few minutes once or twice a day; at the end of a fortnight, she may be transferred from the bed to a lounge placed alongside; but preferably, she should not walk at all before the end of the third week, though during this week she may sit up for a short time twice a day. The fourth week she can go about the room, and the fifth about the house. At the end of six weeks she will be able to resume her usual duties and pleasures.

While this very gradual "getting up" is undoubtedly best, reducing the risk of subsequent uterine trouble to a minimum, the period of convalescence may be shortened somewhat after the second week in the cases of those who cannot well spare so much time from their families; but whenever efforts to make more rapid progress are attended by great fatigue, by dizziness, backache, or other untoward symptoms, they

should be suspended immediately. In all cases the first ten days should be spent in bed; after this, the successive steps toward recovery may be hastened; they must, however, be taken with strict regard to their effects in each case. There are two quite constant indications for rest in bed which should be heeded always: (1) backache, (2) reappearance of blood in the discharge from the vagina. Many women suffer from uterine disease, following, it may be, long after childbirth, or a miscarriage, but which, nevertheless, is directly due to imprudence during the period of convalescence therefrom, particularly to "getting up" too soon—before nature has had time to complete her perfect work of restoration.

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